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U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

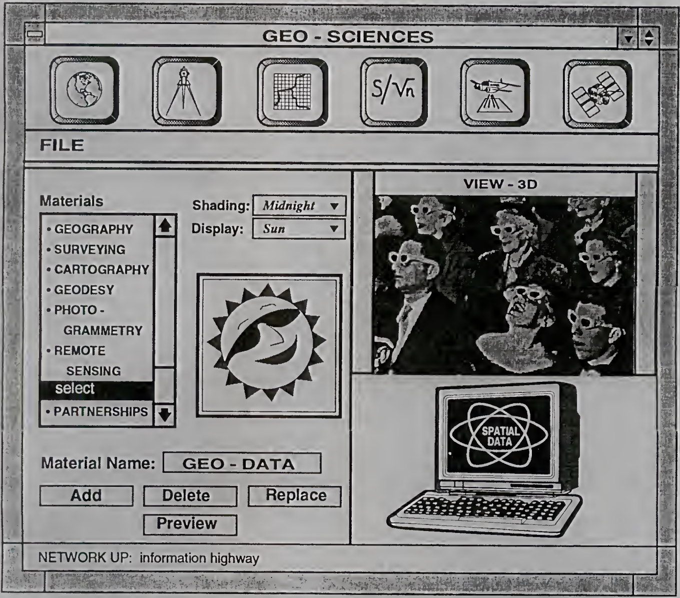
National Training Center

Course Number 1730-11

June 12 - 16, 1995

GEO - DATA COLLECTION & USE

(for Ecosystem Based Management)



Shading: *Midnight*
Display: *Sun*

Material Name: GEO - DATA

NETWORK UP: information highway

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BLM - NATIONAL TRAINING CENTER

Course Title:	**GEODATA COLLECTION & USE (for Ecosystem Mgmt.)**	*Course Number:*	**1730-11C**
Scheduled For:	**June 12-16, 1995**	*Duration of Course:*	**40 Hours**
Coordinator:	**Diane C. Nelson**	*Location of Course:*	**BLM Service Center, Denver**
Instructors:	**Pam Clemmer, Melinda Walker, Dan Martin (Service Center, Applied Sciences), Gretchen Meyer (Wyoming S.O.), Ken Bays (Oregon S.O.), Phil Wilkins (Arizona S.O.), Patsy Lynch (Colorado S.O.), Stan French (U.S.F.S., R-9)**		

Monday: June 12	**Tuesday:** June 13	**Wednesday:** June 14	**Thursday:** June 15	**Friday:** June 16
convene 8:00 am	convene 8:00 am	convene 8:00 am	convene 8:00 am	convene 8:00 am
Introduction: - welcome / housekeeping - course objectives * *skill check scenarios* 8:00 - 9:00 (Diane) **Coord. Systems & Datums:** - NAD 27, NAD 83, WGS 84 - geodetic, plane coordinates - units of measurement 9:15 - 11:30 (Pam)	**Data Sources:** * *assessment by group* **Records Administration:** - requirements (OARD) - data stewardship - electronic exchange/share 8:45 - 10:00 (Patsy) **RDBMS:** **"Relational Data Base Mgmt.Syst."** - tables, entities, queries, etc. 10:15 - 11:30 (Melinda)	**Global Positioning System:** - basic geodesy - satellite positioning 8:00 - 10:00 (Ken) **Geographic Info Systems:** - data dictionary 10:15 -11:30 (Dan) **** Depart for Field Trip** **** Lunch with Group**	**GIS Logic:** - point, polygon, lines, - attributes, vector & rastor - themes, layers * *analog assessment* 8:00 - 10:00 (Gretchen) **GPS: (computer)** - download data, P-Finder * *collection assessment* 10:15 - 11:30 (Ken)	**Spatial Analysis Integration:** - ARC/INFO software - pre-planning - layer analysis - coincidence (data hiatus) - data modeling * *integration use assessment* 8:00 - 11:30 (Dan)
LUNCH BREAK 11:30 - 12:30				
Cadastral Survey: - Public Land Survey System - plat & field notes - control networks - legal interpretation 12:30 - 2:45 (Stan) **GCBD:** **"Geodetic Coordinate Data Base"** - using PLSS coordinates in data base files 3:00 - 4:30 (Phil)	**RDBMS continue:** **Data Standards:** - metadata, FDGC/NSDI 12:30 - 1:45 (Melinda) **Remote Sensing:** - procedures for selecting the most appropriate tool - multi-stage analysis - spectral or spatial - ecosystem perspective 2:00 - 4:30 (Pam)	**GPS @ Ken Caryl Ranch:** - data collection techniques - differential techniques - properly attribute - data conversion - demonstrate use with resourse project 12:30 - 4:30 (All)	**Spatial Analysis:** - existing data - digitizing - scanning - standards 12:30 -3:15 (Dan, Pam, Malinda) **Jeopardy (Geo-pardy):** * *GeoData Assessment* 3:30 - 4:30 (All)	**Spatial Analysis Integration continue:** - data partnerships - Internet, FTP access 12:30 - 3:00 (Dan, Melinda)

#1028738384

CLASS NAME:GEODATA COLLECTION AND USE
PV OR FP TYPE:
CLASS CODE:1730-11C
START DATE:06-12-95
END DATE:06-16-95
LOCATION:SERVICE CENTER DENVER
CLASSROOM:
COORDINATOR:DIANE NELSON
HOTEL:

NAME	DUTY STATION	AGENCY\STATE		JOB TITLE
Haas, John	Arizona S.O.	BLM	AZ	Petroleum Engineer
Bridges, Tonya	Barstow R.A.	BLM	CA	Nat. Resource Spec.
Ely, Theresa	D.W.O. (113)	BLM	CO	Cartographer
Gallegos, Darlene	New Mexico S.O. (942)	BLM	NM	Data Base Appl. Spec
Hull, Frances M.	Carson City D.O.	BLM	NV	Outdoor Rec. Planner
Mc Mullin, Rick	Eugene D.O. (942)	BLM	OR	Land Surveyor
Kett, Dave	S.C. (215b)	BLM	SC	Cartographer
Marchase, Mike	S.C. (215b)	BLM	SC	Cartographer
Profaizer, Frank	Utah S.O. (943)	BLM	UT	Land Surveyor
Siscoe, Jim	The Nature Conserv.	PVT	CO	Ecologist/G.I.S. Spc

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OVERALL COURSE OBJECTIVE

The trainee will be able to better understand and integrate the process of data collection, analysis, and display to plan and accomplish ecosystem based management.

DESIRED JOB PERFORMANCE

Using the knowledge of the systems (GIS, GPS, GCDB, and Remote Sensing), the trainee will be able to select and integrate the appropriate tools and techniques.

The trainee will be better able to identify how their work fits into other applications and enhance the usefulness of collected data.

GEO-DATA COLLECTION & USE
Course No. 1730-11

PRE-COURSE KNOWLEDGE ASSESSMENT

There's only one best answer for each question (except where otherwise noted)

CADASTRAL SURVEY

1. *Cadastral surveys of the public lands of the United States are made in conformance to:*

   a. The Land Survey Practice acts of the various States.
   b. Statutory law and its judicial interpretation.
   c. Existing monumentation of deeded private land.
   d. ALTA Land Survey requirements.

2. *The Government survey referred to in a patent:*

   a. Is always the first survey of the area.
   b. Becomes as much a part of the patent, as if it was written upon the face of the document itself.
   c. Can only be identified by an independent resurvey.
   d. Has little significance when doing a resurvey.

3. *The creation of an official federal survey requires:*

   a. A series of legal steps resulting in the creation and protection of property rights.
   b. The signature of the Secretary of the Interior on the certificate of survey.
   c. Meeting the plat filing requirements and specifications designated by state laws.
   d. Must abide by any state court rulings that affect the positions of the involved boundaries.

4. *The Administrative Procedures Act (APA):*

   a. Provides the basic authority to conduct official resurveys.
   b. Requires reduction of paperwork in the federal bureaucracy.
   c. Requires procedural due process where agency actions may affect a person's life, liberty, or property.
   d. Requires the federal agencies to spend less than 10% of their budgets on the administrations of their programs.

5. *Official mineral surveys may be executed by:*

   a. BLM and Forest Service cadastral surveyors.
   b. County Surveyors.
   c. U.S. Mineral Surveyors.
   d. State licensed land surveyors.
   e. All of the above.

6. *It is necessary for the cadastral surveyor to "follow the footsteps" of the original surveyor to:*

   a. Provide topographic calls for your field notes.
   b. Correct measurement errors of the original surveyor.
   c. Keep traversing to a minimum.
   d. Recover evidence of prior surveys.
   e. All of the above.

DATA STANDARDS

7. *Metadata, or "data about data", could consist of?*

   a. Printout Header
   b. GIS Map Legend
   c. GPS Data Dictionary
   d. All of the above
   e. None of the above

8. *Who develops data standards?*

   a. State Data Administrators
   b. BLM Office Managers
   c. GIS Coordinators
   d. Appropriate Data Stewards
   e. Headquarters Directors

9. *Which Items would be addressed by data standards?*

   a. GPS accuracy
   b. Map Scales
   c. GIS Software
   d. Resource Theme Symbology
   e. All of the above

10. *What is the most basic description to understand and manage data?*

   a. Point / Line / Polygon
   b. Resource Data Theme
   c. Color IR Flight Number
   d. Data Element

11. *What must be done to digital data to be able to share and/or exchange information?*

    a. convert to ARC/INFO
    b. convert to four (4) decimal places
    c. adopt data standards
    d. apply the Administrative Procedures Act
    e. prepare for batch data transfer

COORDINATES / PROJECTIONS

12. *What does the term "geographics" refer to?*

    a. coordinates on the State Plane coordinate system
    b. graphics of a geographical region
    c. a precise location in latitude and longitude
    d. coordinates on the UTM grid

13. *What is latitude?*

    a. angular distance measured North and South of the equator
    b. meridians West of the Prime Meridian
    c. angular distance measured East and West of the Prime Meridian
    d. parallels North of the equator

14. *Why are coordinates important in a Geographic Information System?*

    a. to find specific features on the ground
    b. they aren't really that important
    c. to provide the spatial relationship between the features
    d. so you know where you are

15. *What does the abbreviation UTM stand for?*

    a. Universal Transfer Mode
    b. Uniform Terrain Model
    c. Uniform Transformation Matrix
    d. Universal Transverse Mercator

16. *What unit is NAD 27 State Plane Coordinates most commonly expressed in on a 7½ minute topographic map?*

    a. degrees, minutes, seconds
    b. U.S. feet
    c. centimeters
    d. meters

17. *What is a "false Origin"?*

a. the center of a cartesian coordinate system
b. a point that is established so that no negative coordinate values are necessary
c. a geographic coordinate
d. the International Dateline

GPS

18. *What is the current DATUM used by the BLM?*

a. WGS84
b. NAD27
c. NAD83
d. NAD93

19. *How many GPS satellites do you need to observe at the same time to achieve a 3D position?*

a. 3
b. 4
c. 5
d. 2

20. *What is the accuracy of a C/A code GPS receiver used without a base station?*

a. 2-5 meters (50% CEP)
b. 5-10 meters (1 sigma)
c. sub-meter (95% confidence)
d. 25-150 meters (50% CEP)

21. *The position dilution of precision (PDOP)?*

a. Is an important indication of GPS data quality
b. Is an indicator of the geometric strength-of-figure of the satellites observed.
c. Can be predicted with mission planning software.
d. All of the above

22. *Once GPS data has been differentially corrected, what is the format, coordinate system and units used by the Bureau's modernization GIS?*

a. ARC/INFO, UTM, meters
b. MOSS, state plane, International feet
c. AutoCAD, state plane, meters
d. ARC/INFO, UTM, U.S. Survey feet

REMOTE SENSING

23. *Which of the following are considered remotely sensed data?*

    a. satellite imagery
    b. aerial photography
    c. microwave
    d. all of the above

24. *What are the two major divisions of remote sensing?*

    a. aerial photography and satellite imagery
    b. photographic and non-photographic
    c. color infrared and natural color
    d. large and small format

25. *What does "multistage perspective" refer to?*

    a. many different types of remote sensing techniques
    b. different types of film
    c.. studying the landscape from different altitudes, scales, and resolutions
    d. different types of cameras and aircraft

26. *What does spatial resolution refer to?*

    a. The altitude with which the photography is taken
    b. The scale at which the imagery is taken
    c. The type of film that is used in the camera
    d. The limit on how small an object on the earth's surface can be seen

27. *What type of aerial photography is most appropriate for vegetation delineation?*

    a. black-and-white
    b. false-color infrared
    c. natural color
    d. thermal

RECORDS ADMINISTRATION

28. *What Federal statute governs records access?*

    a. The Freedom of Information Act
    b. The Computer Security Act
    c. Federal Land Policy Management Act (FLPMA)
    d. All of the above

29. *Can e-mail be an official record?*

    a. Yes
    b. No
    c. Never on Sundays

30. *The purpose of Official Agency Record Documentation (OARD) is to:* ***(Choose two)***

    a. ensure records have legal admissibility in courts.
    d. designate authority to the Data Administrator to transfer files to achieves.
    c. ensure that we have lots of information in our files.
    d. designate records as official for external access and internal use.

31. *A non-public record is a record which we would never release to an external non-federal party.*

    a. True
    b. False

32. Which of the following *records are categorized as "public records" ?* ***(Choose three)***

    a. BLM Manuals
    b. BLM Instruction Memorandums
    c. General Correspondence Files
    d. Congressional Letters
    e. Cadastral Survey Plat and Field Notes
    f. Geographic Coordinate Data Base

SPATIAL DATA & ANALYSIS

33. *What is the first step in organizing a GIS project?*

    a. manage and manipulate the analysis of the data
    b. connect the topology between the features
    c. build the data base
    d. interdisciplinary planning
    e. Identify digitizing errors

34. *One of the most common techniques for determining geographic coordinates in GIS, is to:*

    a. let GCDB do it.
    b. use satellite imagery; then import and analyze the data.
    c. use existing maps or orthophotos for field compilation; then digitize data into GIS (using a digitizing tablet).
    d. use current census data (i.e., "Tiger" files); then convert data into GIS.

35. *In GIS the most important factor in achieving the highest data "accuracy" is:*

    a. software processing capability
    b. source and collection method of data
    c. resolution of workstation or terminal
    d. making a terrific looking "publishable" paper map
    e. the lunar phase

36. *Which is the "older form" of a data collection used today for GIS?*

    a. mapping aerial photos
    b. mapping from orthophotos
    c. photogrammetry
    d. using satellites

37. *A cartographic model is:*

    a. A logic flow diagram outlining the sequence of GIS "prime" functions required to produce an end product.

    b. Best produced by an interdisciplinary team identifying the desired end product and the known spatial data base (generally working from the end result product asking how can I obtain that and working backwards).

    c. A record of the process used and subject for revision and update.

    d. All of the above

38. *Identify the program (module) that is not part of ESRI's software:*

    a. ARC/Edit
    b. ARC/View
    c. ARC/Plot
    d. AutoCAD
    e. ARC/Storm

39. *InterNet discussion groups useful to GIS Resource Specialists are:* ***(Choose two)***

    a. Groupwise

    b. AIX

    c. GIS_L

    d. ESRI_L

    e. XWindows

* * * *There is only one best answer for each question (blank space)* * * *

40. Match the following software with the program names:

____ a. IMAGINE

____ b. INFORMIX

____ c. TELNET

____ d. FTP

____ e. ARC/INFO

1. Relational Data Base Management System
2. Remote data transfer
3. Raster Image Processing System
4. Remote System Access
5. Spatial Analysis Capability
6. Computer Graphics Program

RELATIONAL DATA BASE

A. foreign
B. column
C. entity
D. value
E. table
F. primary
G. attribute
H. display

41. A noun in the business world usually becomes __________ in a data base model.

42. An adjective or adverb describing that noun would become ____________ .

43. An entity usually corresponds to ____________ .

44. An attribute becomes _____________ in a table.

45. This key is an attribute that makes each row in a given table unique. _____________

46. This key is an attribute from another table that can tie the two tables together. _______

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
BLM MANAGERS COURSE GUIDE
modem: (602) 906-5626

Course Number:
1730-11

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1. Course Title:
Geo-Data Collection and Use (for Ecosystems Management)

Coordinator: Diane Nelson (TC-400)

2. Duration of Course:
40 hours

3. Course Offered:
Jan 30-Feb 3 & Mar. 20-24, 1995 (Denver)
June 5-9 (NTC)

4. Course Objectives:

Given the systems of GIS, GPS, GCDB, RDBMS, ARC/INFO & Remote Sensing - trainees will be able *to*:

- Identify the data collection tools currently used by the bureau and select the appropriate system(s) that will enhance the usefulness of geographic information and spatial analysis.
- Understand the basic concept of satellite use and the capabilities of the Global Positioning System (GPS) and integrate GPS collected data into geo-spatial modeling.
- Understand the concepts, terms, and data types involved with the Geographic Information Systems (GIS) and apply spatial data collection and analysis.
- Utilize remote sensing and photogrammetric techniques to integrate the use of satellite imagery, aerial photos and digital photographic imaging as part of the spatial integration.
- Evaluate the methods used for establishing the Public Lands Survey System (PLSS).
- Delineate Geographic Coordinate Data Base (GCDB) datum and identify the land base interrelationship to resource areas.
- Comprehend the relational data base (RDBMS) functions and apply table selections and attributes with existing metadata standards.
- Discuss current and future software use for spatial data integration that link the various land status layers associated with wildlife, recreation, minerals, biodiversity and cadastral survey.
- Discern the fundamental benefits and/or limitations of data collection and use to coordinate the geo-sciences more effectively when planning mapping projects for resource and boundary management.
- Appreciate geospatial data in a network environment and develop partnerships that will enhance the spatial data infrastructure.

5. Brief Description of Course:

This is a foundations course designed to identify the interrelationships of data collection and spatial analysis by integrating the geosciences and ecosystem management into one course. The course will emphasize coordinate values, data standards and geo-positioning techniques currently used within the bureau. GPS receiver considerations and accuracy issues will be examined. Both conceptual and hands-on segments will be apart of the GPS/GIS hardware and software lesson. Problem solving scenarios will be associated with each major topic. The course will include a case study in which an interdisciplinary ecosystem management situation will need to be resolved by utilizing several of the systems taught.

6. Target Group:

- Managers (all levels)
- Any Team Specialists from the GeoSciences, Wildlife, Fisheries, Rangeland, Cultural, Recreational, Minerals, Fire, Realty or Landscape Resource Groups.
- Program Specialists (those whose primary jobs involve the collecting, processing, analysis, and integration of spatial data into the Bureau's automation system).

7. Remarks:

The interdisciplinary environment of this course will offer those within the target group who may be familiar with parts of the systems mentioned above, an opportunity to increase their abilities by examining other technologies and sharing geographical information collectively.

June, 1995

Ken Bays

Geodesist
Bureau of Land Management

Biographical Information:

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Education:
A.S. "Surveying" - Chemeketa Community College - Salem, Oregon
B.S. "General Science (Biology)" - Oregon State Univ. - Corvallis, Oregon

Career Summary:

1988 - Present	**Geodesist, BLM, Oregon State Office, Portland**
1987 - 1988	**Land Surveyor, BLM, Arizona State Office, Phoenix**
1975 - 1987	**Land Surveyor, BLM, Alaska State Office, Anchorage**

Special Interests, Professional & Community Affiliations:

Member: Professional Land Surveyors of Oregon
American Congress on Surveying and Mapping

Interests: hiking, photography, old truck restoration

June, 1995

Pam Clemmer

Remote Sensing Training Coordinator
Bureau of Land Management

Biographical Information:

Address:
BLM, National Applied Resources Sciences Center
Federal Center, (SC-215C)
Building 50, P.O. Box 25047
Denver, Colorado 80225-0047

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Internet e-mail: ☞ pclemmer@dsc.blm.gov

Groupwise mail: ☞ pclemmer ilmscd53 ilmscc50

Education:
B.A. "Cartography / Geography" - Kansas State University, Manhattan
Defense Mapping School - Fort Belvoir, Virginia

Career Summary:

1991 - Present	**Remote Sensing Training Coordinator**, BLM, Denver Service Center, CO
1989 - 1991	**Lead Cartographer**, Cartography Section, BLM, Denver Service Center, CO
1986 - 1989	**Training Instructor**, Federal Systems Div., Intergraph Corp., Huntsville, AL
1975 - 1986	**Lead Cartographer** (Photogrammetry), Defense Mapping Agency and Aerospace Center, St. Louis, Missouri
1974 - 1975	**Photogrammetrist**, Western Air Maps, Lenexa, Kansas

Special Interests, Professional & Community Affiliations:

Outdoors: hiking, biking, skiing,

Indoors: reading, cooking, needlework

June, 1995

Daniel W. Martin

Archeologist/GIS/GPS Specialist
Bureau of Land Management

Biographical Information:

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BLM, National Applied Resources Sciences Center
Federal Center, (SC-214)
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FAX: 303-236-3508

Internet e-mail: ☞ dmartin@dsc.blm.gov

Groupwise mail: ☞ dmartin ilmscc5 ilmscd53

Education:

20 credit hours towards a doctorate degree - "Archeology" - U of C, Boulder

M.A. "Archeology & Environmental Biology" -
University of Colorado, Boulder (1971)

B.A. "Anthropology" - The Colorado College - Colorado Springs (1965)

Career Summary:

1984 - Present	**Archeologist / GIS / GPS Specialist**, BLM, Denver Service Center, Colorado
1978 - 1984	**Archeologist / Program Manager**, BLM, Colorado State Office
1978 - 1978	**Archeologist**, National Park Service, Denver, Colorado
1974 - 1978	**Archeologist / Program Leader**, BLM, Montana State Office, Billings

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Special Interests, Professional & Community Affiliations:

Member: Society for Americam Archeology
Business: (with wife) operators of an Indian Arts shop - "The Anasazi Trading Post" in Lyons, CO
Family: daughter (w/two grandchildren), son (electrical engineer)

Memo

To: Geodata Class Jun '95

From: Dan Martin, SC-214

Date: June 16, 1995 Friday

Time: 12:23 pm

Subject: Enjoyed working with you!

Congratulations on completing the GeoData Collection and Use Course. I've enjoyed meeting and working with you this past week. I hope that this mutual learning experience will continue into the future.

Please bear in mind that as you do your jobs, that I am here to aid you in any way that I can. You are my customers, and you provide me with the realities of what you are doing and how science and technology can be useful in our missions.

Communication potentials have never been better from a technical standpoint. Please stay in touch.

Address:Dan Martin, Archeologist/GIS/GPS Specialist, USDI, BLM
National Applied Resource Sciences Center (SC-214)
Denver Federal Center (DFC)
Building 50, P.O. Box 25047
Denver, Colorado 80225-0047
Internet:dmartin@dsc.blm.gov
or "internet!ilmscd53.dmartin@sc1429wp.sc.blm.gov"FTS2000Mail=d1martin
(303)236-0105 FAX:(303)236-3508

GPS DATA to ARC/INFO

Trimble PFINDER generated file that indicates what you have and how to use what you have.

MASSEY.inf

Input Files: 3
1. MASSEY.COR
2. 100100.COR
3. ROADFILE.COR

Information File: D:\PFPRO\DATA\GEODATA\MASSEY.inf
Printer Output: Disable
Data Collected: Jan 27 20:48:26 1995
GIS: Arc/Info-Info
Datum: NAD-27 CONUS
Ellipsoid: CLARKE 1866
Coords: Universal Transverse Mercator
Projection: Universal Transverse Mercator
UTM Zone Used: 13S
Units: METERS 2D
Reference Alt: 2D
Altitude Unit: N/A
Position Source: Features Only
Filter Used: None
Attr. to output: Attribute Values

GPS DATA to ARC/INFO

Trimble PFINDER generated file that indicates what you have and how to use what you have.

MASSEY.inf

Data Dictionary Structure:

For input file: 1. MASSEY.COR

- **ARCH_SITE_BDY**
  - **ARCH_SITE_BDY**
  - **ARCH_SITE_NAME**
  - **ARCH_SITE_NUM**
  - **AGENCY_DESCRIPTION**
  - **MEMO**
- **DWELLINGS**
  - **DWELLINGS**
  - **DWELLING NAME**
  - **CONSTRUCTION**
  - **CONDITION**
  - **MEMO**
  - **MEMO**
- **SITE FEATURES**
  - **SITE_FEATURES**
  - **FEATURE TYPE**
  - **ORIGIN DATE**
  - **DEPTH**
  - **NAME/NUMBER**
  - **MEMO**

GPS DATA to ARC/INFO

Trimble PFINDER generated file that indicates what you have and how to use what you have.

MASSEY.inf

- ROADS
  - ROADS
  - ROAD NAME
  - MEMO
  - ROAD SURFACE
  - LANES
- TRAILS
  - TRAILS
  - TRAIL NAME
  - TRAIL CONDITION
- PICTOGRAPH
  - PICTOGRAPH
  - PHOTO ID NO
  - SKETCH ID NO
  - CONDITION
- ARTIFACT
  - ARTIFACT
  - TYPE
  - MEMO
- Point (generic)
  - POINT__GENERIC_
  - COMMENT
- Line (generic)
  - LINE___GENERIC_
  - COMMENT
- Area (generic)
  - AREA___GENERIC_
  - COMMENT

GPS DATA to ARC/INFO

Trimble PFINDER generated file that indicates what you have and how to use what you have.

MASSEY.inf

Data Dictionary Structure:

For input file: 2. 100100.COR

- ARCH_SITE_BDY
  - ARCH_SITE_BDY
  - ARCH_SITE_NAME
  - ARCH_SITE_NUM
  - AGENCY_DESCRIPTION
  - MEMO
- DWELLINGS
  - DWELLINGS
  - DWELLING NAME
  - CONSTRUCTION
  - CONDITION
  - MEMO
  - MEMO
- SITE FEATURES
  - SITE_FEATURES
  - FEATURE TYPE
  - ORIGIN DATE
  - DEPTH
  - NAME/NUMBER
  - MEMO
- ROADS
  - ROADS
  - ROAD NAME
  - MEMO
  - ROAD SURFACE
  - LANES

GPS DATA to ARC/INFO

Trimble PFINDER generated file that indicates what you have and how to use what you have.

MASSEY.inf

TRAILS
  TRAILS
  TRAIL NAME
  TRAIL CONDITION
PICTOGRAPH
  PICTOGRAPH
  PHOTO ID NO
  SKETCH ID NO
  CONDITION
ARTIFACT
  ARTIFACT
  TYPE
  MEMO
Point (generic)
  POINT__GENERIC_
  COMMENT
Line (generic)
  LINE___GENERIC_
  COMMENT
Area (generic)
  AREA___GENERIC_
  COMMENT

GPS DATA to ARC/INFO

Trimble PFINDER generated file that indicates what you have and how to use what you have.

MASSEY.inf

Data Dictionary Structure:

For input file: 3. ROADFILE.COR

- **ARCH_SITE_BDY**
  - **ARCH_SITE_BDY**
  - **ARCH_SITE_NAME**
  - **ARCH_SITE_NUM**
  - **AGENCY_DESCRIPTION**
  - **MEMO**
- **DWELLINGS**
  - **DWELLINGS**
  - **DWELLING NAME**
  - **CONSTRUCTION**
  - **CONDITION**
  - **MEMO**
  - **MEMO**
- **SITE FEATURES**
  - **SITE_FEATURES**
  - **FEATURE TYPE**
  - **ORIGIN DATE**
  - **DEPTH**
  - **NAME/NUMBER**
  - **MEMO**

GPS DATA to ARC/INFO

Trimble PFINDER generated file that indicates what you have and how to use what you have.

MASSEY.inf

- **ROADS**
  - **ROADS**
  - **ROAD NAME**
  - **MEMO**
  - **ROAD SURFACE**
  - **LANES**
- **TRAILS**
  - **TRAILS**
  - **TRAIL NAME**
  - **TRAIL CONDITION**
- **PICTOGRAPH**
  - **PICTOGRAPH**
  - **PHOTO ID NO**
  - **SKETCH ID NO**
  - **CONDITION**
- **ARTIFACT**
  - **ARTIFACT**
  - **TYPE**
  - **MEMO**
- **Point (generic)**
  - **POINT__GENERIC_**
  - **COMMENT**
- **Line (generic)**
  - **LINE___GENERIC_**
  - **COMMENT**
- **Area (generic)**
  - **AREA___GENERIC_**
  - **COMMENT**

GPS DATA to ARC/INFO

Trimble PFINDER generated file that indicates what you have and how to use what you have.

MASSEY.inf

Data Output Files:

Files with extension .GEN contain position information for line or polygon feature.
Files with extension .AA contain attribute information for line feature.
Files with extension .PTS contain position information for point feature or polygon label.
Files with extension .PA contain attribute information for point feature or polygon label.

Files D:\PFPRO\DATA\GEODATA\ARCH_S1.GEN,
D:\PFPRO\DATA\GEODATA\ARCH_S1.AA,
D:\PFPRO\DATA\GEODATA\ARCH_S1.PTS,
D:\PFPRO\DATA\GEODATA\ARCH_S1.PA
store information for feature: ARCH_SITE_BDY

GPS DATA to ARC/INFO

Trimble PFINDER generated file that indicates what you have and how to use what you have.

MASSEY.inf

Files D:\PFPRO\DATA\GEODATA\DWELLI2.GEN,
D:\PFPRO\DATA\GEODATA\DWELLI2.AA,
D:\PFPRO\DATA\GEODATA\DWELLI2.PTS,
D:\PFPRO\DATA\GEODATA\DWELLI2.PA
store information for feature: DWELLINGS

Files D:\PFPRO\DATA\GEODATA\SITE_F3.GEN,
D:\PFPRO\DATA\GEODATA\SITE_F3.AA,
D:\PFPRO\DATA\GEODATA\SITE_F3.PTS,
D:\PFPRO\DATA\GEODATA\SITE_F3.PA
store information for feature: SITE FEATURES

Files D:\PFPRO\DATA\GEODATA\ROADS4.GEN,
D:\PFPRO\DATA\GEODATA\ROADS4.AA,
D:\PFPRO\DATA\GEODATA\ROADS4.PTS,
D:\PFPRO\DATA\GEODATA\ROADS4.PA
store information for feature: ROADS

Files D:\PFPRO\DATA\GEODATA\TRAILS5.GEN,
D:\PFPRO\DATA\GEODATA\TRAILS5.AA,
D:\PFPRO\DATA\GEODATA\TRAILS5.PTS,
D:\PFPRO\DATA\GEODATA\TRAILS5.PA
store information for feature: TRAILS

GPS DATA to ARC/INFO

Trimble PFINDER generated file that indicates what you have and how to use what you have.

MASSEY.inf

Files D:\PFPRO\DATA\GEODATA\PICTOG6.GEN,
D:\PFPRO\DATA\GEODATA\PICTOG6.AA,
D:\PFPRO\DATA\GEODATA\PICTOG6.PTS,
D:\PFPRO\DATA\GEODATA\PICTOG6.PA
store information for feature: PICTOGRAPH

Files D:\PFPRO\DATA\GEODATA\ARTIFA7.GEN,
D:\PFPRO\DATA\GEODATA\ARTIFA7.AA,
D:\PFPRO\DATA\GEODATA\ARTIFA7.PTS,
D:\PFPRO\DATA\GEODATA\ARTIFA7.PA
store information for feature: ARTIFACT

Files D:\PFPRO\DATA\GEODATA\POINT_8.GEN,
D:\PFPRO\DATA\GEODATA\POINT_8.AA,
D:\PFPRO\DATA\GEODATA\POINT_8.PTS,
D:\PFPRO\DATA\GEODATA\POINT_8.PA
store information for feature: Point (generic)

Files D:\PFPRO\DATA\GEODATA\LINE__9.GEN,
D:\PFPRO\DATA\GEODATA\LINE__9.AA,
D:\PFPRO\DATA\GEODATA\LINE__9.PTS,
D:\PFPRO\DATA\GEODATA\LINE__9.PA
store information for feature: Line (generic)

Files D:\PFPRO\DATA\GEODATA\AREA__10.GEN,
D:\PFPRO\DATA\GEODATA\AREA__10.AA,
D:\PFPRO\DATA\GEODATA\AREA__10.PTS,
D:\PFPRO\DATA\GEODATA\AREA__10.PA
store information for feature: Area (generic)

GPS DATA to ARC/INFO

Trimble PFINDER generated file that indicates what you have and how to use what you have.

MASSEY.inf

Feature files containing no data will be deleted at the end of the translation process.

June, 1995

Gretchen Meyer

Natural Resource Specialist - Remote Sensing
Bureau of Land Management

Biographical Information:

Address:
BLM, Wyoming State Office (WY-941)
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Phone: (307) 775-6243
FAX: 307-775-6173

Education:
B.S. "Wildlands and Range Science"
University of California at Davis (1977)

Career Summary:

1984 - Present	**Natural Resource Specialist**, BLM, Wyoming State Office, Cheyenne
1979 - 1984	**Range Conservationist**, BLM, Wyoming State Office, Cheyenne
1978 - 1979	**Range Technician**, BLM, Wyoming State Office, Cheyenne

Special Interests, Professional & Community Affiliations:

Outdoors: skiing, bicycling, rafting, scuba diving, hiking, running
(all of which I never have enough time to do)

Indoors: working out (bicycling, stretching, some lifting), reading

Family: son (my greatest joy!)

June, 1995

Diane C. Nelson

Land Surveyor / Training Coordinator
Bureau of Land Management

Biographical Information:

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9828 North 31st Avenue
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Phone: (602) 906-5548
FAX: 602-906-5555

Groupwise mail: ☞ DNelson ilmazbtc ilmazatc

Education: B.S. "Geography" - University of Oregon, Eugene &
Southern Oregon State College, Ashland &
Portland State University, Oregon (1978)

Career Summary:

1993 - Present	**Cadastral Survey Training Coordinator**, BLM, Nat'l Training Ctr, Phoenix, AZ.
1985 - 1993	**Land Surveyor**, Survey Preparation & Records, BLM, Alaska S.O., Anchorage
1986 - 1986	**Geographer**, Photogrammetry, BLM, Oregon State Office, Portland
1981 - 1985	**Forester / Fire Boss**, USFS, Willamette Nat'l Forest, Detroit, Oregon
1980 - 1981	**Survey Crew Boss**, USFS, Wallowa-Whitman National Forest, Baker, Oregon
1974 - 1977	**Naturalist** (seasonal hire), USDI, National Park Service
	Mt. McKinley (Denali) National Park, Alaska (1976 - 1977)
	Acadia National Park, Maine (1975)
	Yellowstone National Park, Wyoming (1974)

Special Interests, Professional & Community Affiliations:

Member: American Congress of Surveying & Mapping
Special: humor in the work place ("too serious" is not a prerequisite for getting the job done)
Interests: hiking, camping, bicycling, downhill and cross-country skiing, (outdoors etc., - all those activities that are great excuses to ensure that I never have time to complete all those never-ending around the house projects).

June, 1995

Melinda Walker

Natural Resources Specialist
Bureau of Land Management

Biographical Information:

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Internet e-mail: ☞ mwalker@dsc.blm.gov
Groupwise mail: ☞ mwalker ilmscd53 ilmscc50

Education: B.S. "Forest Management" - Colorado State University

presently working on Masters for "Remote Sensing & GIS",
Colorado State University, Fort Collins (stay-tuned 1997)

Career Summary:

1991 - Present	**Natural Resource Specialist**, Remote Sensing, BLM, Denver Service Ctr., CO
1989 - 1991	**Cartographer**, GCDB Project, BLM, Denver Service Center, Colorado
1986 - 1989	**Cartographer**, Photogrammetry Section, BLM, Denver Service Center, CO
1983 - 1986	**Cartographer**, Defense Mapping Agency, St. Louis, Missouri

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Special Interests, Professional & Community Affiliations:

Outdoors:	skiing, sailing, gardening
Indoors:	quilting, cross-stitching
Community:	singing in the church choir
Service:	summer fire duty
Family:	watching my three kids grow

June, 1995

Phillip L. Wilkins

Land Surveyor
Bureau of Land Management

Biographical Information:

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Phone: (602) 265-7591
FAX: 602-264-5331

FTS 2000 mail: ☞ !pwilkins

Education: 400 + credit hours compiled from
University of Colorado, University of Montana,
University of Alaska, Anchorage,
Oregon Institute of Technology, Klamath Falls

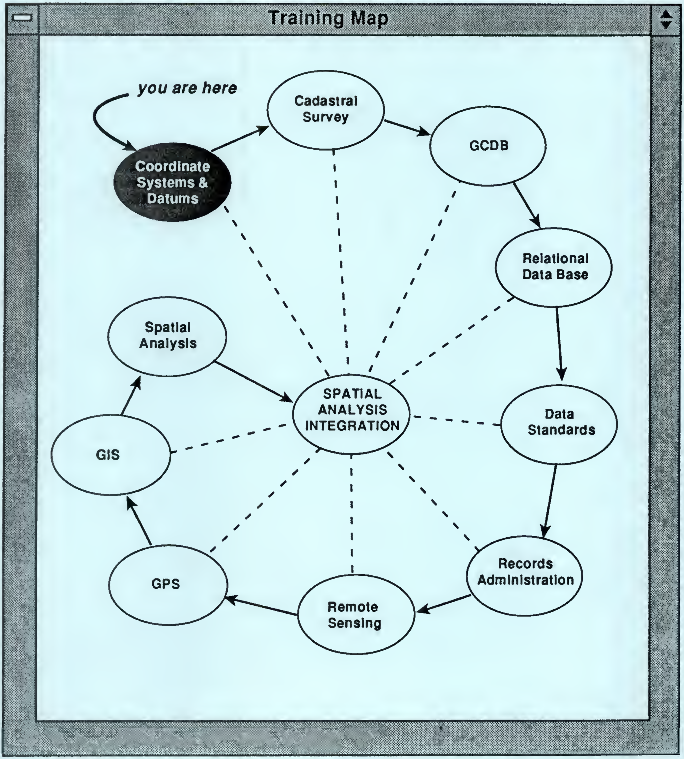
Career Summary:

1992 - Present	**Land Surveyor**, Lead Inspector GCDB Section, BLM, Arizona S.O., Phoenix
1988 - 1992	**Land Surveyor**, Special Instructions Section, BLM, Alaska S.O., Anchorage
1986 - 1988	**Geodesist**, Chief, Control Survey Section, BLM, Alaska S.O., Anchorage
1983 - 1986	**Land Surveyor/Geodesist**, Railroad Project, BLM, Alaska S.O., Anchorage
1980 - 1983	**Engineer Tech.**, Scientific Systems Development, BLM, Denver Service Center
1975 - 1980	**Engineer Tech.**, Office of Engineering, BLM, Colorado State Office
1970 - 1975	**Engineer Tech./Draftsman**, D.O.T., Federal High Admin., Denver Fed. Cntr.
1970 - 1970	**Engineer Tech./Hydrologist**, U.S.G.S., Water Resources Div., Denver Fed. Ctr.

Special Interests, Professional & Community Affiliations:

Interests: collecting movies for video library, football fan (Broncos), bicycling, auto travelling,
Family: grandchildren (five)

GEO - DATA COLLECTION & USE
(for Ecosystem Based Management)



Course No. 1730-11

COORDINATE SYSTEMS and DATUMS

LESSON OBJECTIVE

By discussion and utilization of coordinate systems and datums the Trainee will be able to:

☞ identify the coordinate systems on a 7½-minute quad.

☞ understand the map marginal information available on a 7½-minute quad.

☞ discuss the various types of scales and be able to determine descriptive scale.

What is a coordinate?

Linear or angular quantities which designate the position that a point occupies in a given reference frame or system.

COORDINATE SYSTEMS

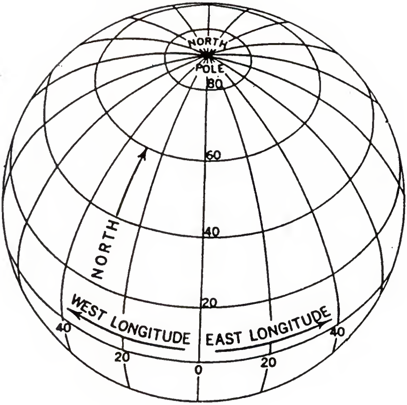
☞ Spherical

☞ Plane

COORDINATE SYSTEMS

☞ **Spherical**

- geographical coordinates
- transformation



GEOGRAPHIC COORDINATES

(LATITUDE & LONGITUDE)

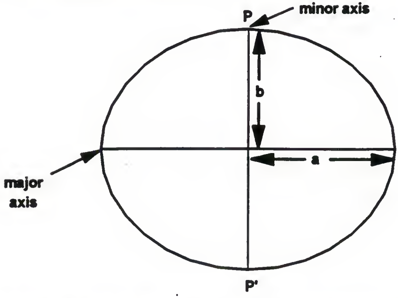
Geodetic Datum

A set of constants specifying the coordinate system used for geodetic control for calculating coordinates of points on the Earth.

Ellipsoid

The surface generated by rotation of an ellipse about one of its axes.

Elements of an Ellipse



a = 1/2 of the major axis = semi-major axis

b = 1/2 of the minor axis = semi-minor axis

f = Flattening = $\frac{a - b}{a}$

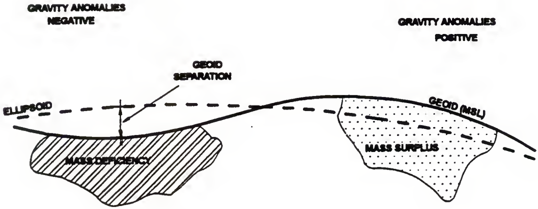
PP' = Axis of revolution of the Earth's ellipsoid

Reference Ellipsoid

An ellipsoid of specified dimensions which is associated with a geodetic reference system (mathematically defined model of the Earth's surface).

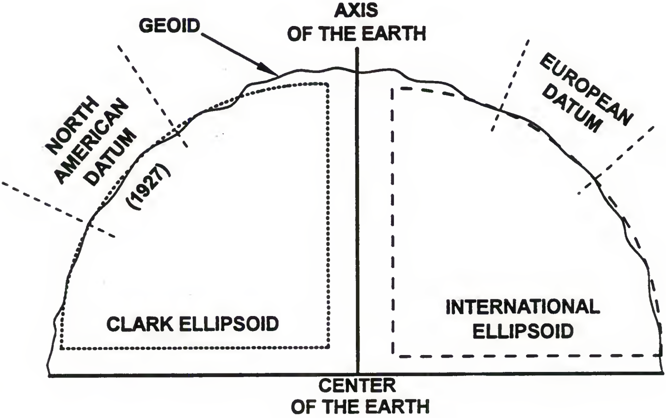
Geoid

The equipotential surface of the Earth's gravity field which best fits, in the least squares sense, mean sea level.

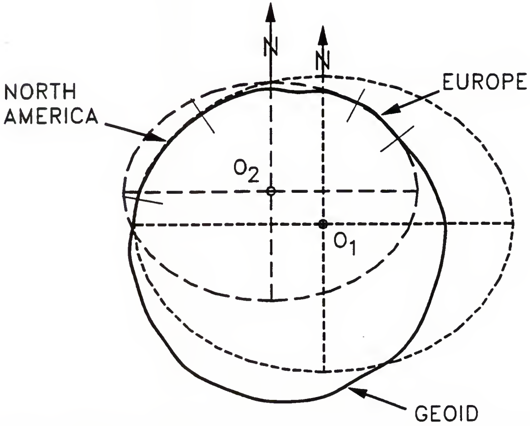


THE EFFECT OF MASS ANOMALIES
ON THE GEOID

Geoid - Ellipsoid Relationship



THE GEOID AND TWO ELLIPSOIDS



Relative Datum (NAD-27)

- Latitude & Longitude of Meades Ranch.
- Azimuth of a line from the initial point to Waldo.
- Reference ellipsoid Clark 1866.

[Revised: 1 March 1988]

Local Geodetic Systems
Related to World Geodetic System 1984

Local Geodetic Systems (Datums)	Associated Reference Ellipsoid
L. C. 5 Astro	Clarke 1866
Liberia 1964	Clarke 1880
Luzon	Clarke 1866
Mahe 1971	Clarke 1880
Marco Astro	International
Massawa	Bessel 1841
Merchich	Clarke 1880
Midway Astro 1961	International
Minna	Clarke 1880
Nahrwan	Clarke 1880
Naparima, BWI	International
→ North American 1927	Clarke 1866 ←
North American 1983	GRS 80*
Observatorio 1966	International
Old Egyptian	Helmert 1906
Old Hawaiian	Clarke 1866
Oman	Clarke 1880
Ordnance Survey of Great Britain 1936	Airy
Pico de las Nieves	International
Pitcairn Astro 1967	International
Provisional South Chilean 1963**	International
Provisional South American 1956	International
Puerto Rico	Clarke 1866
Qatar National	International
Qornoq	International
Reunion	International
Rome 1940	International
Santo (DOS)	International
São Braz	International
Sapper Hill 1943	International
Schwarzeck	Bessel 1841
South American 1969	South American 1969
South Asia	Modified Fischer 1960
Southeast Base	International
Southwest Base	International
Timbalai 1948	Everest
Tokyo	Bessel 1841
Tristan Astro 1968	International
Viti Levu 1916	Clarke 1880
Wake-Eniwetok 1960	Hough
Zanderij	International

* Geodetic Reference System 1980

** Also known as Hito XVIII 1963

Geocentric Datum (WGS-84)

- Origin is the Earth's center of mass.
- Right handed coordinated system:
  - X oriented to pass through the equator at Greenwich.
  - Y oriented to pass through the equator 90 degrees East of Greenwich.
  - Z oriented to pass through the North pole.
- Reference ellipsoid WGS 1984.

GIS datum configurations

- NAD27:
  - Ellipsoid is Clark 1866
  - state plane coordinates in survey feet
  - UTM coordinates in meters
- NAD83:
  - Ellipsoid is GRS 1980
  - state plane coordinates in meters
  - UTM coordinates in meters
- WGS84:
  - Ellipsoid is WGS 1984
  - UTM coordinates in meters

Table 7.5 (Cont'd)
Transformation Parameters
- Local Geodetic Systems to WGS 84 -

Local Geodetic Systems*	Reference Ellipsoids and Parameter Differences**			Number of Doppler Stations Used to Determine Transformation Parameters	Transformation Parameters**		
	Name	Δa(m)	$\Delta f \times 10^4$		ΔX(m)	ΔY(m)	ΔZ(m)
NAPARIMA, BWI Trinidad and Tobago	International	-251	-0.14192702	1	-2	374	172
NORTH AMERICAN 1927	Clarke 1866	-69.4	-0.37264639				
Mean Value (CONUS)				405	-8	160	176
Alaska				47	-5	135	172
Bahamas (Excluding San Salvador Island)				11	-4	154	178
San Salvador Island				1	1	140	165
Canada (Including Newfoundland Island)				112	-10	158	187
Canal Zone				3	0	125	201

---

* Geoid heights computed using spherical harmonic expansion and WGS 84 EGM coefficient set (n=m=180), then referenced to the ellipsoid and orientation associated with each of the local geodetic systems.

** WGS 84 minus local geodetic system

Table 7.5 (Cont'd)
Transformation Parameters
- Local Geodetic Systems to WGS 84 -

Local Geodetic Systems*	Reference Ellipsoids and Parameter Differences**			Number of Doppler Stations Used to Determine Transformation Parameters	Transformation Parameters**		
	Name	Δa(m)	$\Delta f \times 10^4$		ΔX(m)	ΔY(m)	ΔZ(m)
NORTH AMERICAN 1983 Alaska, Canada, Central America, CONUS, Mexico	GRS 80	0	-0.00000016	379	0	0	0
OBSERVATORIO 1966 Corvo and Flores Islands (Azores)	International	-251	-0.14192702	3	-425	-169	81
OLD EGYPTIAN Egypt	Helmert 1906	-63	0.00480795	14	-130	110	-13
OLD HAWAIIAN Mean Value	Clarke 1866	-69.4	-0.37264639	13	61	-285	-181
OMAN Oman	Clarke 1880	-112.145	-0.54750714	7	-346	-1	224

* Geoid heights computed using spherical harmonic expansion and WGS 84 EGM coefficient set (n=m=180), then referenced to the ellipsoid and orientation associated with each of the local geodetic systems.

** WGS 84 minus local geodetic system

[Revised: 1 March 1988]

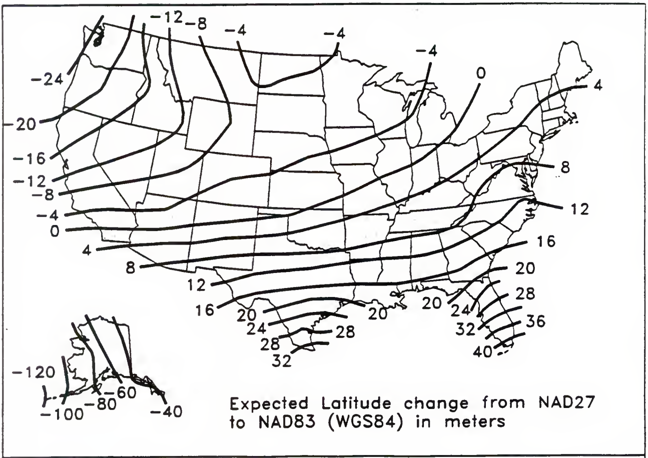
Table 7.4

Reference Ellipsoid Constants

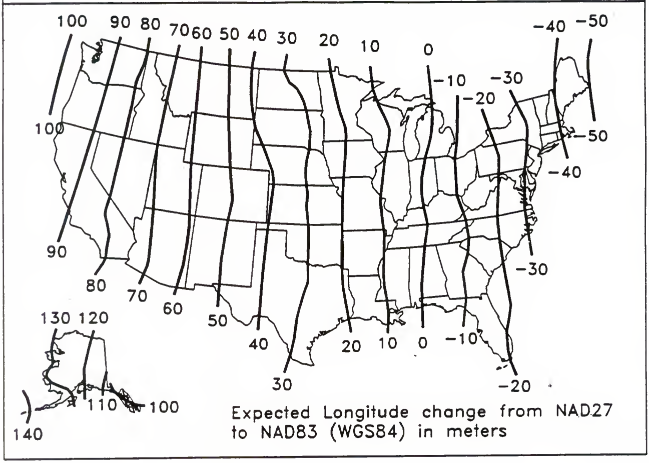
Reference Ellipsoids	a (Meters)	f
Airy	6377563.396	1/299.3249646
Modified Airy	6377340.189	1/299.3249646
Australian National	6378160	1/298.25
Bessel 1841	6377397.155*	1/299.1528128
Clarke 1866	6378206.4	1/294.9786982
Clarke 1880	6378249.145	1/293.465
Everest	6377276.345	1/300.8017
Modified Everest	6377304.063	1/300.8017
Fischer 1960 (Mercury)	6378166	1/298.3
Modified Fischer 1960 (South Asia)	6378155	1/298.3
Fischer 1968	6378150	1/298.3
Geodetic Reference System 1967	6378160	1/298.247167427
Geodetic Reference System 1980	6378137	1/298.257222101
Helmert 1906	6378200	1/298.3
Hough	6378270	1/297
International	6378388	1/297
Krassovsky	6378245	1/298.3
South American 1969	6378160	1/298.25
WGS 60	6378165	1/298.3
WGS 66	6378145	1/298.25
WGS 72	6378135	1/298.26
WGS 84	6378137	1/298.257223563

* In Namibia, use a = 6377483.865 meters for the Bessel 1841 Ellipsoid.

[Revised: 1 March 1988]

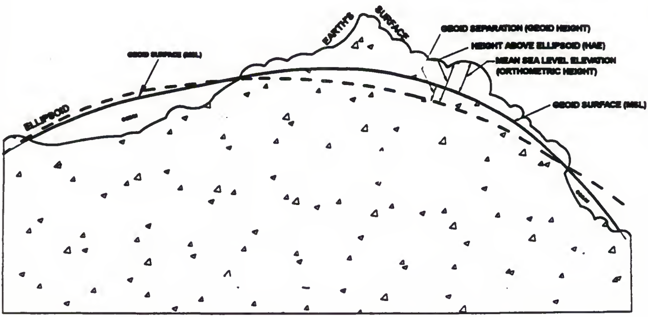


Expected Latitude change from NAD27 to NAD83 (WGS84) in meters

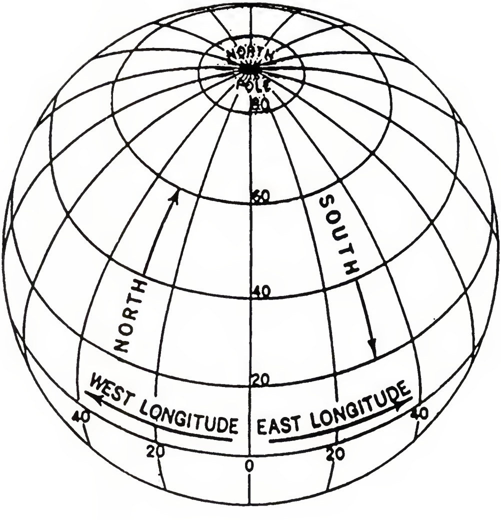


Expected Longitude change from NAD27 to NAD83 (WGS84) in meters

GEOID-ELLIPSOID RELATIONSHIPS


EARTH'S SURFACE
GEOID SURFACE (MSL)
ELLIPSOID
GEOID SEPARATION (GEOID HEIGHT)
HEIGHT ABOVE ELLIPSOID (HAE)
MEAN SEA LEVEL ELEVATION (ORTHOMETRIC HEIGHT)
GEOID SURFACE (MSL)

MEAN SEA LEVEL ELEVATION = HAE - GEOID HEIGHT


NORTH POLE
NORTH
SOUTH
WEST LONGITUDE
EAST LONGITUDE

TRANSFORMATION

Transformation is the manner in which the spherical surface of the Earth is represented onto the two dimensional surface of a map. The process is called *projection*.

FLATTENING CONTINUUM

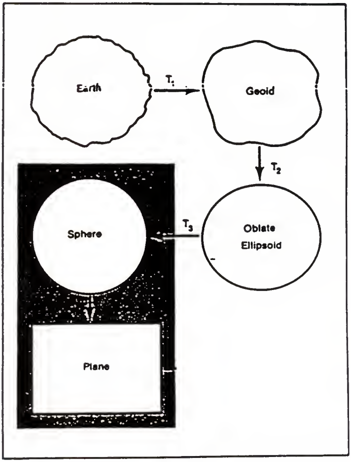
A series of distorting transformations is required in the map projection process. The highly irregular earth's surface is initially transformed into a much simpler three-dimensional surface, and this derived surface is subsequently projected onto a plane.

T_1 (transformation 1) in the following diagram projects the highly irregular surface of the earth onto a more regular imaginary surface known as the *geoid.* This is the surface that would result if the average level of the world's oceans were extended under the continents.

T_2 projects the undulating geoid onto a still more regular oblate *ellipsoid or spheroid.* This new surface serves as the basis for geodetic and astronomic coordinates used by surveyors.

T_3 projects the oblate ellipsoid onto a still more regular *sphere.* This produces the standard globe, which serves as the model for the common spherical coordinates of latitude and longitude.

T_4 is the transformation most directly associated with map projection, and involves mapping the spheroid onto a *plane* surface. The greatest distortion of the earth's surface occurs in this step.



MAP PROJECTION

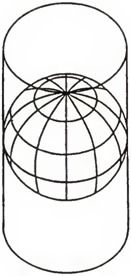
A systematic drawing of lines on a plane surface to represent the parallels of latitude and the meridians of longitude of the Earth or a section of the Earth.

MAP PROPERTIES

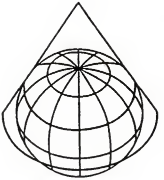
- Equal-Area
- Conformal
- Equidistance
- Azimuthal

DEVELOPABLE SURFACES

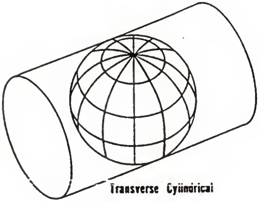
- ☞ Cone
- ☞ Cylinder
- ☞ Plane



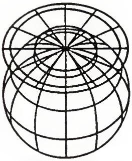
Regular Cylindrical



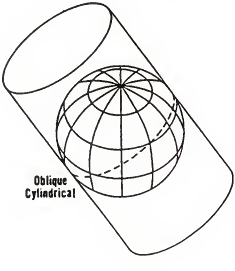
Regular Conic



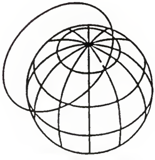
Transverse Cylindrical



Polar Azimuthal
(plane)



Oblique
Cylindrical



Oblique Azimuthal
(plane)

The Globe

Directions—True.

Distances—True.

Shapes—True.

Areas—True.

Great circles—The shortest distance between any two points on the surface of the Earth can be found quickly and easily along a great circle.

Disadvantages:
Even the largest globe has a very small scale and shows relatively little detail.

Costly to reproduce or update.

Difficult to carry around.

Bulky to store.

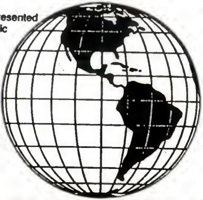
On the globe:
Parallels are parallel and are spaced equally on meridians. Meridians and other arcs of great circles are straight lines (if looked at perpendicularly to the Earth's surface). Meridians converge toward the poles and diverge toward the Equator.

Meridians are equally spaced on the parallels, but their distance apart decreases from the Equator to the poles. At the Equator, meridians are spaced the same as parallels. Meridians at 60° are half as far apart as parallels. Parallels and meridians cross at right angles. The area of the surface bounded by any two parallels and two meridians (a given distance apart) is the same anywhere between the same two parallels.

The scale factor at each point is the same in any direction.

After Robinson and Sale, *Elements of Cartography* (3rd Edition, John Wiley & Sons, Inc., 1969, p. 212).

Globe, as represented by Orthographic projection—equatorial aspect



Mercator

Used for navigation or maps of equatorial regions. Any straight line on map is a **rhumb line** (line of constant direction). **Directions** along a rhumb line are true between *any* two points on map, but a rhumb line usually is *not* the shortest distance between points. (Sometimes used with Gnomonic map on which any straight line is on a great circle and shows shortest path between two points.)

Distances are true *only* along Equator, but are reasonably correct within 15° of Equator; special scales can be used to measure distances along other parallels. Two particular parallels can be made correct in scale instead of the Equator.

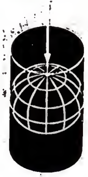
Areas and shapes of large areas are distorted. **Distortion** increases away from Equator and is extreme in polar regions. Map, however, is **conformal** in that angles and shapes within any small area (such as that shown by a USGS topographic map) are essentially true.

The map is not perspective, equal area, or equidistant.

Equator and other parallels are straight lines (spacing increases toward poles) and meet meridians (equally spaced straight lines) at right angles. Poles are not shown.

Presented by Mercator in 1569.

Cylindrical—Mathematically projected on a cylinder tangent to the Equator. (Cylinder may also be secant.)



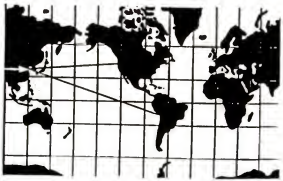
Central meridian (selected by mapmaker)

Great distortion in high latitudes

Examples of rhumb lines (direction true between any two points)

Equator touches cylinder if cylinder is tangent

Reasonably true shapes and distances within 15° of Equator



Transverse Mercator

Used by USGS for many quadrangle maps at scales from 1:24,000 to 1:250,000; such maps can be joined at their edges only if they are in the same zone with one central meridian. Also used for mapping large areas that are mainly north-south in extent.

Distances are true *only* along the central meridian selected by the mapmaker or else along two lines parallel to it, but all distances, directions, shapes, and areas are reasonably accurate within 15° of the central meridian. **Distortion** of distances, directions, and size of areas increases rapidly outside the 15° band. Because the map is conformal, however, shapes and angles within any small area (such as that shown by a USGS topographic map) are essentially true.

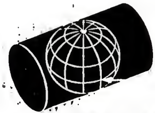
Graticule spacing increases away from central meridian. Equator is straight. Other parallels are complex curves concave toward nearest pole.

Central meridian and each meridian 90° from it are straight. Other meridians are complex curves concave toward central meridian.

Presented by Lambert in 1772.

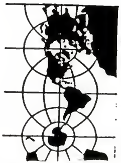
Cylindrical—Mathematically projected on cylinder tangent to a meridian. (Cylinder may also be secant.)

Central meridian selected by mapmaker touches cylinder if cylinder is tangent.



Equator

Can show whole Earth, but directions, distances, and areas are reasonably accurate only within 15° of the central meridian.



Albers Equal Area Conic

Used by USGS for maps showing the conterminous United States (48 states) or large areas of the United States. Well suited for large countries or other areas that are mainly east-west in extent and that require equal-area representation. Used for many thematic maps.

Maps showing adjacent areas can be joined at their edges only if they have the same standard parallels (parallels of no distortion) and the same scale.

All areas on the map are proportional to the same areas on the Earth. **Directions** are reasonably accurate in limited regions. **Distances** are true on both standard parallels. Maximum scale error is 1¼% on map of conterminous States with standard parallels of 29½°N and 45½°N. **Scale true only** along standard parallels.

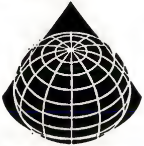
USGS maps of the conterminous 48 States, if based on this projection, have standard parallels 29½°N and 45½°N. Such maps of Alaska use standard parallels 55°N and 65°N, and maps of Hawaii use standard parallels 8°N and 18°N.

Map is not conformal, perspective, or equidistant.

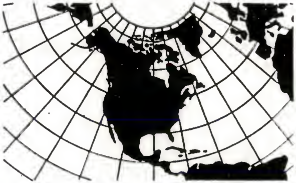
Presented by H. C. Albers in 1805.

Conic—Mathematically projected on a cone conceptually secant at two standard parallels.

Two standard parallels (selected by mapmaker)



Equal areas. Deformation of shapes increases away from standard parallels.



Lambert Conformal Conic

Used by USGS for many 7.5- and 15-minute topographic maps and for the State Base Map series. Also used to show a country or region that is mainly east-west in extent.

One of the most widely used map projections in the United States today. Looks like the Albers Equal Area Conic, but graticule spacings differ.

Retains conformality. **Distances** true *only* along standard parallels; reasonably accurate elsewhere in limited regions. **Directions** reasonably accurate. **Distortion** of shapes and areas minimal at, but increases away from standard parallels. **Shapes** on large-scale maps of small areas essentially true.

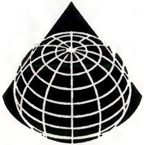
Map is **conformal** but not perspective, equal area, or equidistant.

For USGS Base Map series for the 48 conterminous States, standard parallels are 33°N and 45°N (maximum scale error for map of 48 States is 2½%). For USGS Topographic Map series (7.5- and 15-minute), standard parallels vary. For aeronautical charts of Alaska, they are 55°N and 65°N; for the *National Atlas of Canada*, they are 49°N and 77°N.

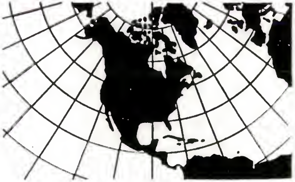
Presented by Lambert in 1772.

Conic—Mathematically projected on a cone conceptually secant at two standard parallels.

Two standard parallels (selected by mapmaker)



Large-scale map sheets can be joined at edges if they have same standard parallels and scale.



Space Oblique Mercator

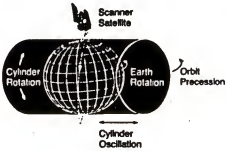
This new space-age conformal projection was developed by the USGS for **use in Landsat images** because there is no distortion along the curved groundtrack under the satellite. Such a projection is needed for the continuous mapping of satellite images, but it is useful only for a relatively narrow band along the groundtrack.

Space Oblique Mercator maps show a satellite's groundtrack as a curved line that is continuously true to scale as orbiting continues.

Extent of the map is defined by orbit of the satellite.

Map is basically **conformal**, especially in region of satellite scanning.

Developed in 1973-79 by A. P. Colvocoresses, J. P. Snyder, and J. L. Junkins.



Polyconic

Used almost exclusively for large-scale mapping in the United States until the 1950's. Now nearly obsolete, and no longer used by USGS for new plotting in its Topographic Map series. Best suited for areas with a north-south orientation.

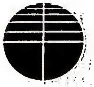
Directions are true *only* along central meridian. **Distances** are true *only* along each parallel and along central meridian. **Shapes and areas** true *only* along central meridian. **Distortion** increases away from central meridian.

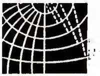
Map is a compromise of many properties. It is not conformal, perspective, or equal area.

Apparently originated about 1820 by Hassler.

Conic--Mathematically based on an infinite number of cones tangent to an infinite number of parallels.

The slant heights of the tangent cones become the radii of the parallels of latitude





Summary

● = Yes
O = Partly

Projection	Type	Properties							Suitable for Mapping						General Use					
		Conformal	Equal area	Equidistant	True direction	Perspective	Compromise	Straight rhumbs	World	Hemisphere	Continent/Ocean	Region/Sea	Medium Scale	Large Scale	Topographic Maps	Geological Maps	Thematic Maps	Presentations	Navigation	USGS Maps
Globe	Sphere	●	●	●	●				●								●	●		
Mercator	Cylindrical	●			O			●	O			●			●	●			●	●
Transverse Mercator	Cylindrical	●									●	●	●	●	●	●				●
Oblique Mercator	Cylindrical	●									●	●	●	●	●					●
Space Oblique Mercator	Cylindrical	●												●	●					●
Miller Cylindrical	Cylindrical						●		●								●			●
Robinson	Pseudocylindrical						●		●								●	●		
Sinusoidal Equal Area	Pseudocylindrical		●	O					●		●						●			●
Orthographic	Azimuthal				O	●				O										●
Stereographic	Azimuthal	●			O	●				●	●	●	●	●	●	●			●	●
Gnomonic	Azimuthal				O	●						O						●	●	
Azimuthal Equidistant	Azimuthal			O	O				O	●	●	●		O	●					●
Lambert Azimuthal Equal Area	Azimuthal		●		O					●	●	●					●	●		●
Albers Equal Area Conic	Conic		●								●	●	●				●	●		●
Lambert Conformal Conic	Conic	●			O						●	●	●	●	●	●		●	●	●
Equidistant Conic (Simple Conic)	Conic			O							●	●								
Polyconic	Conic			O			●						O	O	●					●
Bipolar Oblique Conic Conformal	Conic	●									●					●				●

All above projections (except Robinson) are explained in detail in *Map Projections—A Working Manual*, John P. Snyder, Geological Survey Professional Paper 1395 (Washington: USGPO, 1987, 383 pp.)

eneral Notes:

zimuth—The angle measured in degrees between base line radiating from a center point and another ne radiating from the same point. Normally, the base ne points North, and degrees are measured clockise from the base line.

spect—Individual azimuthal map projections are vided into three aspects: the polar aspect which is ngent at the pole, the equatorial aspect which is ngent at the Equator, and the oblique aspect which tangent anywhere else (The word "aspect" has placed the word "case" in the modern cartographic erature.)

onformality—A map projection is conformal when t any point the scale is the same in every direction herefore, meridians [illegible] rallels intersect at right ngles and the shap [illegible] ry small areas and angles with very short sides are preserved. The size of most areas, however, is distorted.

Developable surface—A developable surface is a simple geometric form capable of being flattened without stretching. Many map projections can then be grouped by a particular developable surface: cylinder, cone, or plane.

Equal areas—A map projection is equal area if every part, as well as the whole, has the same area as the corresponding part on the Earth, at the same reduced scale. No flat map can be both equal area and conformal.

Equidistant—Equidistant maps show true distances *only* from the center of the projection or along a special set of lines. For example, an Azimuthal Equidistant map centered at Washington shows the correct the projection. It shows the correct distance between Washington and San Diego and between Washington and Seattle. But it does not show the correct distance between San Diego and Seattle. No flat map can be both equidistant and equal area.

Graticule—The graticule is the spherical coordinate system based on lines of latitude and longitude.

Great circle—A circle formed on the surface of a sphere by a plane that passes through the center of the sphere. The Equator, each meridian, and each other full circumference of the Earth forms a great circle. The arc of a great circle shows the shortest distance between points on the surface of the Earth.

near scale—Linear scale is the relation between a stance on a map and the corresponding distance the Earth. Scale varies from place to place on every map. The degree of variation depends on the projection used in making the map.

Map projection—A map projection is a systematic representation of a round body such as the Earth o a flat (plane) surface. Each map projection has specific properties that make it useful for specific purposes.

Rhumb line—A rhumb line is a line on the surface the Earth cutting all meridians at the same angle. A rhumb line shows true direction. Parallels and meri ans, which also maintain constant true directions, may be considered special cases of the rhumb line A rhumb line is a straight line on a Mercator projection. A straight rhumb line does not show the short distance between points [illegible] the points are on th Equator or on the same n [illegible].

READING GEOGRAPHIC COORDINATES USING THE **D° TERMINATOR** TEMPLATE

The **D° Terminator** template is used to determine geographic coordinates at any latitude or longitude on a 7½-minute topographic map. The template is designed to read coordinates between the 2½-minute tick marks shown on 7½-minute maps as cross-tick marks. Notice that the template reads from 0 to 2½-minutes or 2 minutes, 30 seconds. Each division represents 5 seconds on a 7½-minute map.

When aligning the template, be sure to place the template so that the numbers are increasing in the correct direction. Latitude readings increase to the north for locations north of the equator (0° latitude). Longitude readings increase to the west for locations west of the Prime Meridian (0° longitude). Look at a 7½-minute map and notice how the corner geographic values increase to the north and west.

Full geographic lines are only shown on the "neatline" of the map. Tick marks are placed at 2½-minute intervals along the neatline. To facilitate correct alignment of the template, connect the 2½-minute geographic tick marks found along the neatline of the map with the 2½-minute ticks found on the interior of the quad. The four interior 2½-minute ticks assist in connecting the exterior ticks. *Example 1* shows exterior and interior 2½-minute tick marks (the four circled intersections) that are located in the map interior and along the neatline of the map sheet. Lines have been extended between the circled tick marks. In the example, geographic coordinates are determined for the found section corner 25, 26, 35, 36 (elevation 6067T). The section corner is circled on the examples.

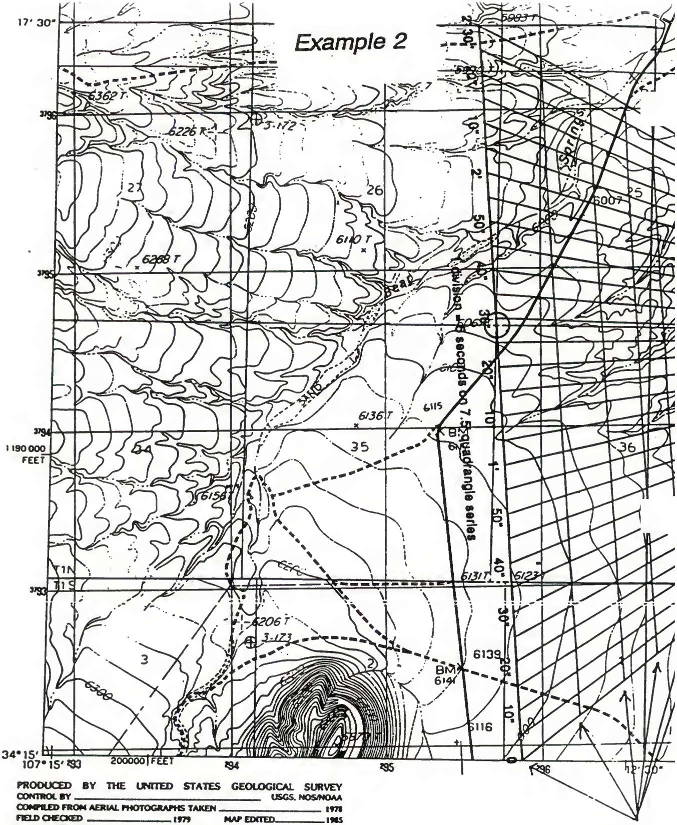
To read the latitude value, align the template with the numbers increasing to the north. In *Example 2*, the longest guideline of the template is aligned between the southern neatline (34°15') and the 2½-minute tick line (17'30"). The template guideline should touch both geographic lines *and* crosses the feature (section corner). Notice that the template is slightly crooked in order to fit correctly between the two geographic lines. The found corner is located at approximately 1'28" on the template. Since latitude increases from the equator in the northern hemisphere, *add* the template value to the latitude value 34°15'00"N. (southern geographic line of the map).

34°15'00"
+ 1'28"
34°16'28"N. latitude.

To read the longitude value, align the template with the numbers increasing to the west. Use the shortest guideline that will fit between the geographic lines. In *Example 3*, the second guideline from the bottom of the template is used. Notice that the ends of the template guideline fall on the geographic lines *and* cross with the section corner. The found corner is located at approximately 38" on the template. Since longitude increases to the west from the Prime Meridian (0°), *add* the template value to the longitude value 107°12'30"W.

107°12'30"
+ 38"
107°13'08"N. latitude.

Example 2



PRODUCED BY THE UNITED STATES GEOLOGICAL SURVEY
CONTROL BY .... USGS, NOS/NOAA
COMPILED FROM AERIAL PHOTOGRAPHS TAKEN 1978
FIELD CHECKED .... 1979 MAP EDITED 1985
PROJECTION .... TRANSVERSE MERCATOR
GRID: 1000-METER UNIVERSAL TRANSVERSE MERCATOR .... ZONE 13
10,000-FOOT STATE GRID TICKS .... NEW MEXICO, CENTRAL ZONE
UTM GRID DECLINATION .... 1°14' WEST
1985 MAGNETIC NORTH DECLINATION .... 11°30' EAST
VERTICAL DATUM .... NATIONAL GEODETIC VERTICAL DATUM OF 1929
HORIZONTAL DATUM .... 1927 NORTH AMERICAN DATUM

To place on the predicted North American Datum of 1983, move the projection lines as shown by dashed corner ticks
(3 meters south and 53 meters east)

There may be private inholdings within the boundaries of any Federal and State Reservations shown on this map

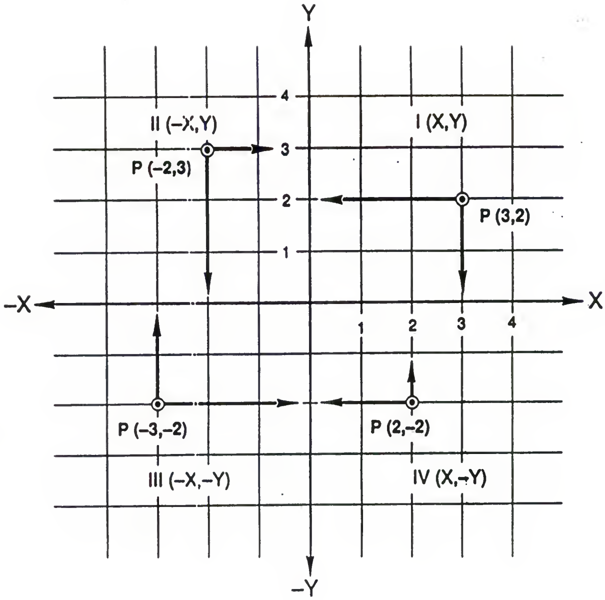
PROVISIONAL MAP
Produced from original manuscript drawings. Information shown as of date of field check.

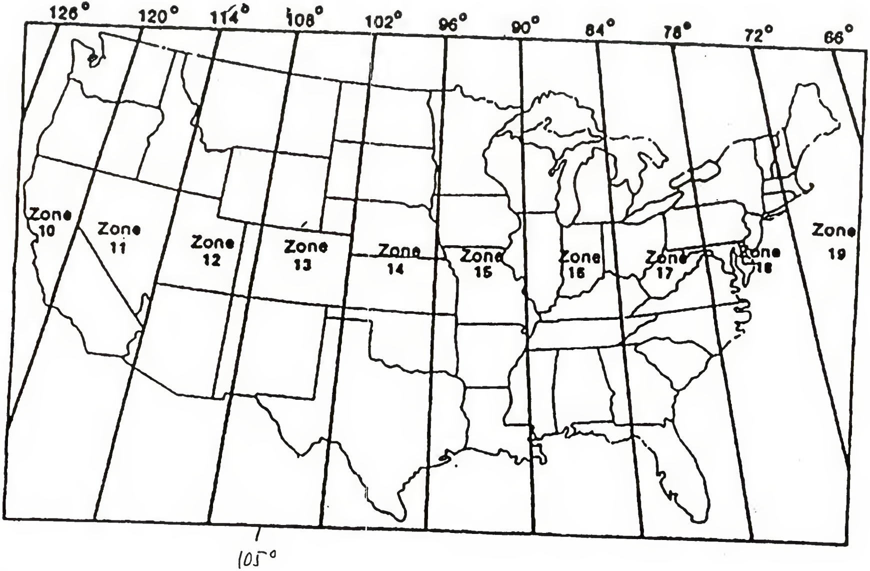
COORDINATE SYSTEMS

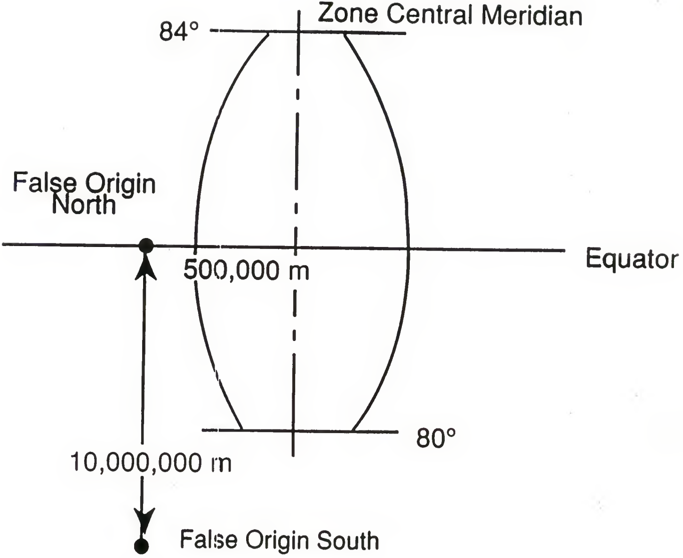
☞ Spherical / Geographic

☞ Plane / Cartesian

- State Plane Coordinates
- Universal Transverse Mercator


Y
4
3
2
1
II (−X,Y)
I (X,Y)
P (−2,3)
P (3,2)
−X
X
1
2
3
4
P (−3,−2)
P (2,−2)
III (−X,−Y)
IV (X,−Y)
−Y


126°
120°
114°
108°
102°
96°
90°
84°
78°
72°
66°
Zone 10
Zone 11
Zone 12
Zone 13
Zone 14
Zone 15
Zone 16
Zone 17
Zone 18
Zone 19
105°


Zone Central Meridian
84°
False Origin North
Equator
500,000 m
80°
10,000,000 m
False Origin South

U.S. Department of the Interior
U.S. Geological Survey
Earth Science
Information Center (ESIC)

Factsheet

The Universal Transverse Mercator (UTM) Grid

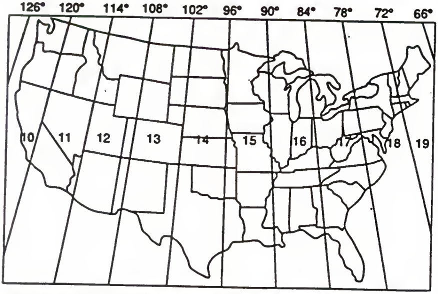


Figure 1. The Universal Transverse Mercator grid that covers the conterminous 48 United States comprises 10 zones—from zone 10 on the west coast through zone 19 in New England.

Map projections

The most convenient way to identify points on the curved surface of the Earth is with a system of reference lines called parallels of latitude and meridians of longitude. On some maps the meridians and parallels appear as straight lines. On most modern maps, however, the meridians and parallels may appear as curved lines. These differences are due to the mathematical treatment required to portray a curved surface on a flat surface so that important properties of the map (such as distance and areal accuracy) are shown with minimum distortion. The system used to portray a portion of the round Earth on a flat surface is called a map projection.

Grids

To simplify the use of maps, and to avoid the inconvenience of pinpointing locations on curved reference lines, a rectangular grid consisting of two sets of straight, parallel lines, uniformly spaced, each set perpendicular to the other, is superimposed on the map. This grid is designed so that any point on the map can be designated by its latitude and longitude or by its grid coordinates, and a reference in one system can be converted into a reference in another system. Such grids are usually identified by the name of the particular projection for which they are designed.

The Universal Transverse Mercator grid

The Defense Mapping Agency adopted a special grid for military use throughout the world called the Universal Transverse Mercator (UTM) grid. In this grid, the world is divided into 60 north-south zones, each covering a strip 6° wide in longitude. These zones are numbered consecutively beginning with zone 1, between 180° and 174° west longitude, and progressing eastward to zone 60, between 174° and 180° east longitude. Thus, the conterminous 48 States are covered by 10 zones, from zone 10 on the west coast through zone 19 in New England (fig. 1). In each zone, coordinates are measured north and east in meters. (One meter equals 39.37 inches, or slightly more than 1 yard.) The northing values are measured continuously from zero at the Equator, in a northerly direction. Southerly values are similarly measured from the Equator, south. A central meridian through the middle of each 6° zone is assigned an easting value of 500,000 meters. Grid values to the west of this central meridian are less than 500,000; to the east, more than 500,000.

Determining a UTM grid value for a map point

The UTM grid is shown on all quadrangle maps prepared by the U.S. Geological Survey. On 7.5-minute quadrangle maps (1:24,000 scale) and 15-minute quadrangle maps (1:50,000, 1:62,500 and standard-edition 1:63,360 scales) the UTM grid lines are indicated at intervals of 1,000 meters, either by blue ticks in the margins of the map or with full grid lines. The 1,000-meter value of the ticks is shown for every tick or grid line. In addition, the actual meter value is shown for ticks nearest the southeast and northwest corners of the map. Provisional maps at 1:63,360 scale show full UTM grids at 5,000-meter intervals.

To use the UTM grid, a transparent grid overlay can be used that subdivides the grid, or lines can be drawn on the map connecting corresponding ticks on opposite edges. The distances can be measured in meters at the map scale between any map point and the nearest grid lines to the south and west. The northing of the point is the value of the nearest grid line south of it plus its distance north of that line; its easting is the value of the nearest grid line west of it plus its distance east of that line (see fig. 2).

On maps at 1:100,000 and 1:250,000 scale, a full UTM grid is shown at intervals of 10,000 meters and is numbered and used in the same way.

Information

For further information contact any Earth Science Information Center (ESIC) or call 1-800-USA-MAPS.

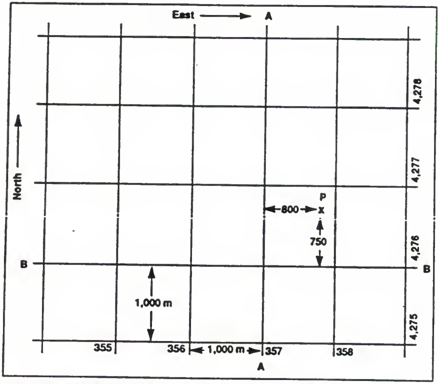
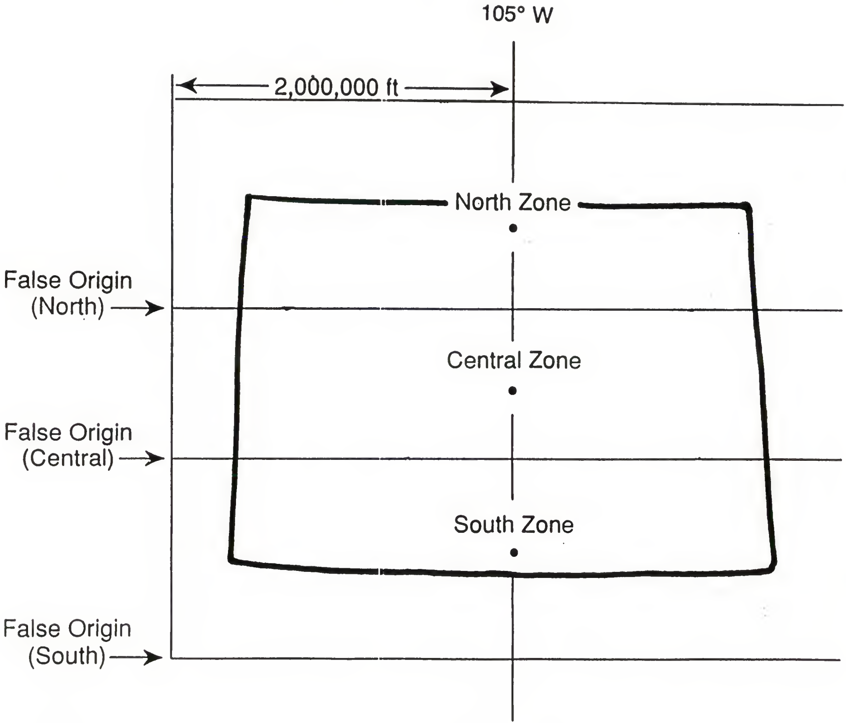
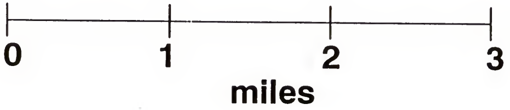


Figure 2. The grid value of line A-A is 357,000 meters east. The grid value of line B-B is 4,276,000 meters north. Point P is 800 meters east and 750 meters north of the grid lines; therefore, the grid coordinates of point P are north 4,276,750 and east 357,800.


105° W
2,000,000 ft
North Zone
Central Zone
South Zone
False Origin (North)
False Origin (Central)
False Origin (South)

SCALE EXPRESSIONS

Graphic Scale:



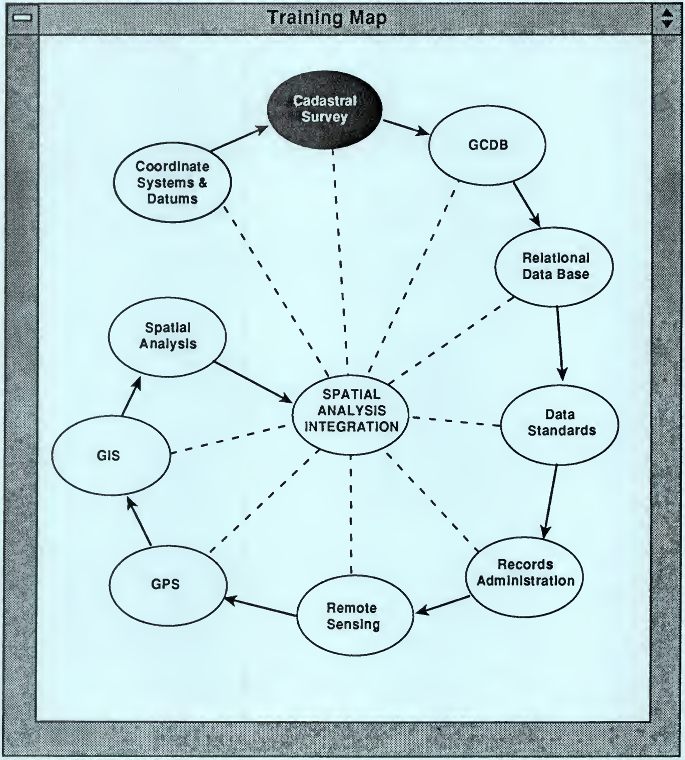
Representative Fraction Scale (RF):

$$\frac{1}{36{,}000} \quad \text{OR} \quad 1/36{,}000$$

Ratio Scale: 1:36,000

Descriptive Scale: 1" = 3000 FEET

GEO - DATA COLLECTION & USE (for Ecosystem Based Management)



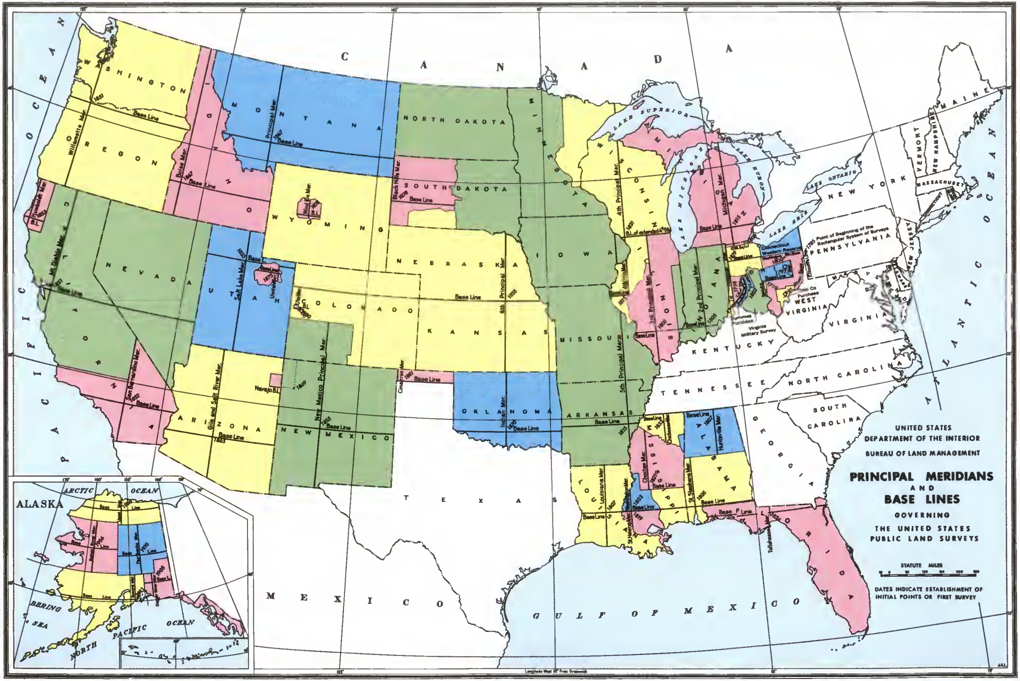
Course No. 1730-11

CADASTRAL SURVEY

LESSON OBJECTIVE

☞ By understanding the Public Lands Survey System the trainee will be able to identify and describe a legal description for a parcel of land.

☞ The trainee will be able to interpret the record description found on a Cadastral Survey plat and field notes and use the corner monument description to adequately begin a search for the monumented corner in the field.



UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

PRINCIPAL MERIDIANS AND BASE LINES

GOVERNING
THE UNITED STATES
PUBLIC LAND SURVEYS

DATES INDICATE ESTABLISHMENT OF INITIAL POINTS OR FIRST SURVEY

INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1988

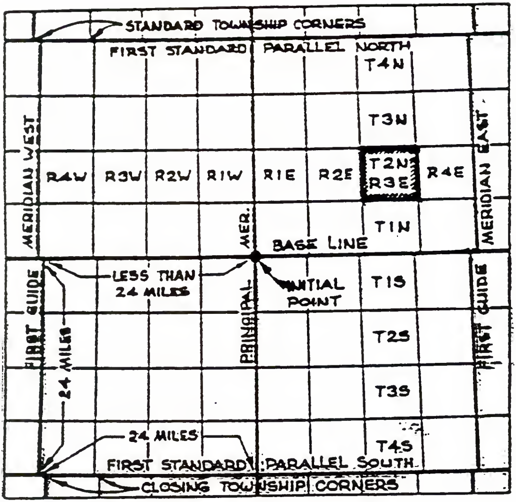
BLM Library
Denver Federal Center
Bldg. 50, OC-521
P.O. Box 25047
Denver, CO 80225

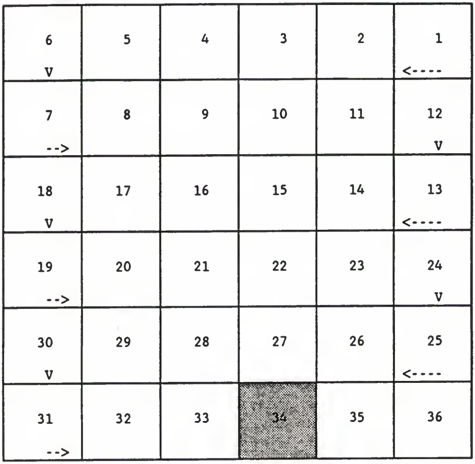
"A Cadastral Survey is a survey which **creates, marks, defines, retraces, or reestablishes** the boundaries and subdivisions of the public lands of the United States."

TOWNSHIP LINE

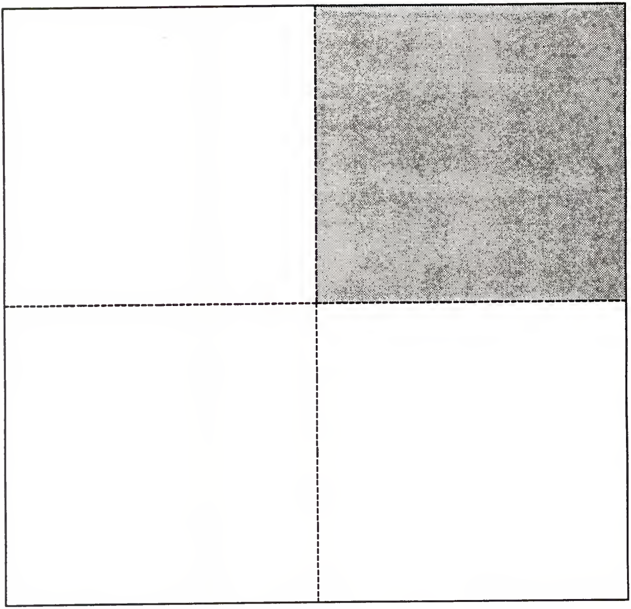
6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

RANGE LINE

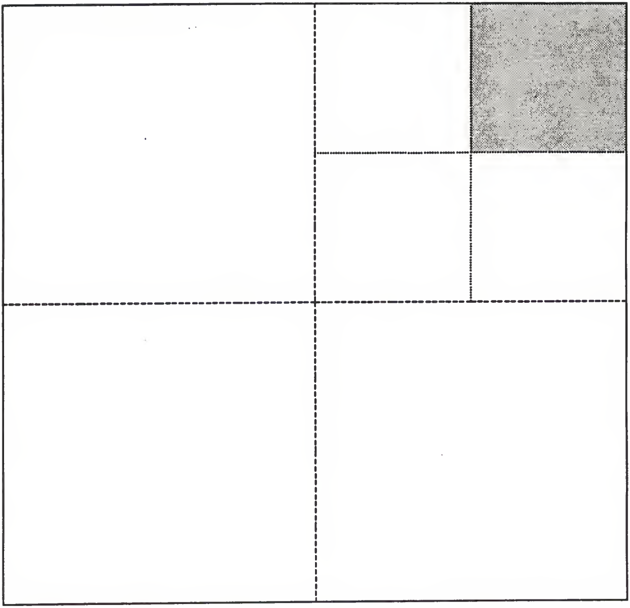

STANDARD TOWNSHIP CORNERS
FIRST STANDARD PARALLEL NORTH
T4N
T3N
MERIDIAN WEST
MERIDIAN EAST
R4W
R3W
R2W
R1W
R1E
R2E
T2N
R3E
R4E
T1N
MER.
BASE LINE
LESS THAN 24 MILES
INITIAL POINT
T1S
FIRST GUIDE
24 MILES
PRINCIPAL
T2S
T3S
24 MILES
T4S
FIRST STANDARD PARALLEL SOUTH
CLOSING TOWNSHIP CORNERS



Township 1 North, Range 3 West,
New Mexico Principal Meridian, New Mexico



SECTION 34
TOWNSHIP 1 NORTH, RANGE 3 WEST,
NEW MEXICO PRINCIPAL MERIDIAN, NEW MEXICO



SECTION 34
TOWNSHIP 1 NORTH, RANGE 3 WEST,
NEW MEXICO PRINCIPAL MERIDIAN, NEW MEXICO

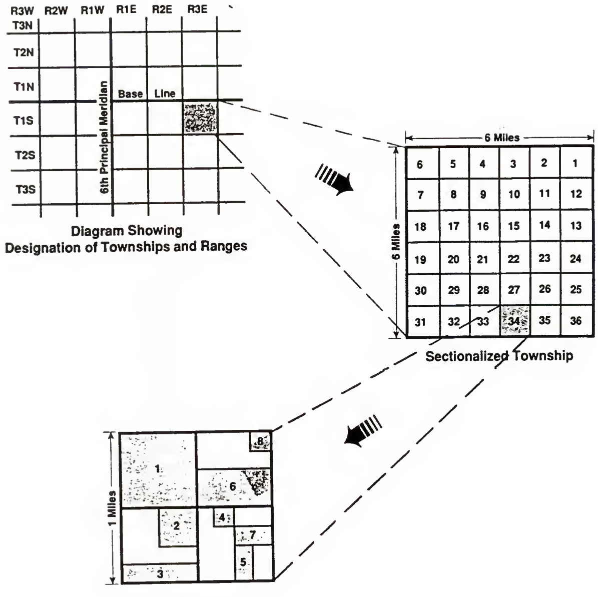


Diagram Showing Designation of Townships and Ranges

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

Sectionalized Township

Quartered Section

(1) ____

(2) ____

(3) ____

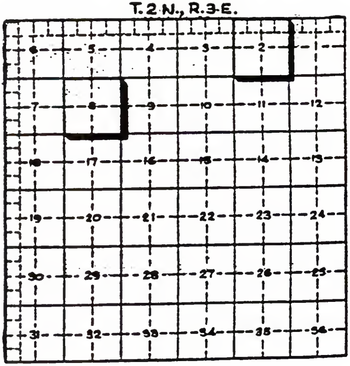
(4) ____

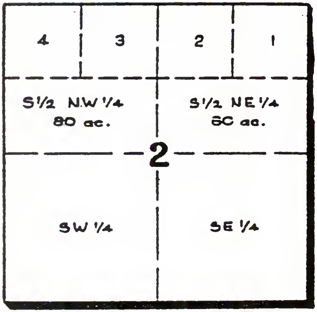
(5) ____

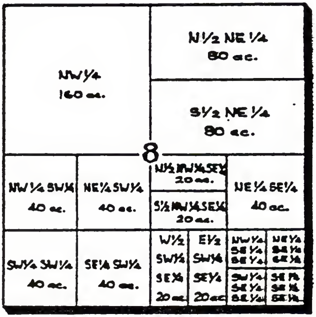
(6) ____

(7) ____

(8) ____


T. 2 N., R. 3 E.


4
3
2
1
S½ N.W ¼
80 ac.
S½ NE ¼
80 ac.
2
SW ¼
SE ¼


NW¼
160 ac.
N½ NE ¼
80 ac.
S½ NE ¼
80 ac.
8
NW¼ SW¼
40 ac.
NE¼ SW¼
40 ac.
N½ NW¼ SE¼
20 ac.
S½ NW¼ SE¼
20 ac.
NE¼ SE¼
40 ac.
SW¼ SW¼
40 ac.
SE¼ SW¼
40 ac.
W½ SW¼ SE¼
20 ac.
E½ SW¼ SE¼
20 ac.
NW¼ SE¼ SE¼
NE¼ SE¼ SE¼
SW¼ SE¼ SE¼
SE¼ SE¼ SE¼

SIGNIFICANCE OF THE MONUMENT:

"Original Township, Section, Quarter-Section, and other monuments as physically evidenced must stand as the true corners of the subdivisions which they were intended to represent. . ."

Section 1-20, Manual of Surveying Instructions, 1973

THE LEGAL SIGNIFICANCE of the PLAT and FIELD NOTES:

"It is a well settled principle that when lands are granted according to an official plat of the survey of such lands, the plat itself, with all its notes, lines, descriptions and landmarks, becomes as much a part of the grant or deed by which they were conveyed, and controls so far as limits are concerned, as if such descriptive features were written out upon the face of the deed or grant itself."

- *"Alaska United Gold Mining Co.*
vs.
Cincinnatti-Alaska Mining Co."

THE MINERAL SURVEY

The Mineral Survey is made to mark the legal boundaries of mineral deposits or ore-bearing formations on federal land where the boundaries are determined by lines other than the normal subdivision of the public lands.

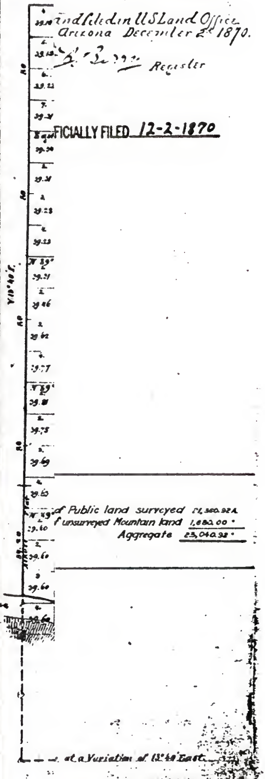
To

2624

and filed in US Land Office
Arizona December 2d 1870.

Register

FICIALLY FILED 12-2-1870



of Public land surveyed 21,360.92 A
f unsurveyed Mountain land 1,680.00 "
Aggregate 23,040.92 "

at a Variation of 13°40' East

t of Gila and [illegible]

Surveys thereof on file in this Office

East

Rest

Secti

Surv. Gen. Cal.

BOOK 1 362A 63

No 7-

Field Notes of the survey of the Subdivision lines of fractional

Township 1 N Range 1 W

of the Gila and Salt River Meridian in the Territory of Arizona by Geo P. Ingalls Deputy Surveyor under his Contract bearing date the 29th day of February 1868

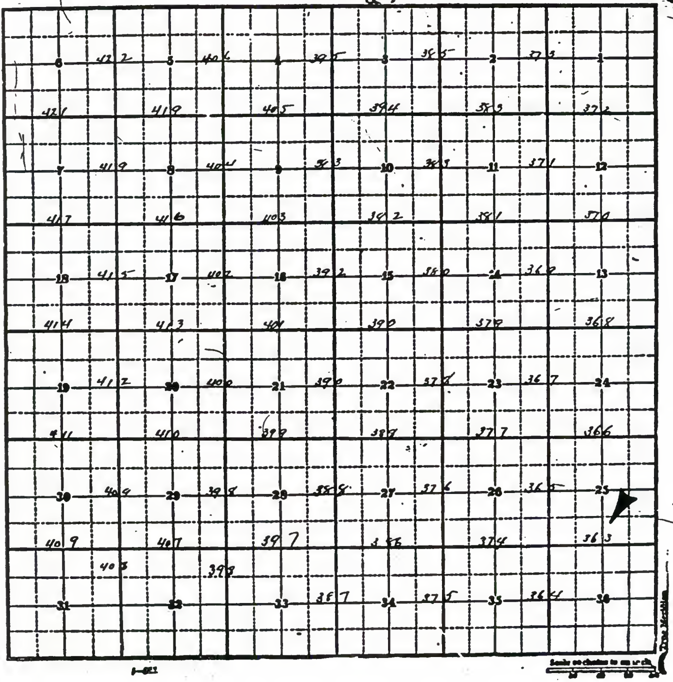
Plalla C.D

Copied for W
(copied)
J.K.T.

Township No. 1 N. Range No. 1 W. G&SRB&M.

BOOK 1

362



Tp 1 N Range 1 W
Gila and Salt River Meridian

Obs This Township is made fractional on the South by mountains unfit for cultivation.

The South Boundary not having been established I therefore begin at cor to Secs 25.36.30 & 31 on East Boundary of Township and run

West on a true line bet Secs 25 & 36
Var 13°20' E as per Solar Compass

40.00 Set a post for 1/4 Sec cor with mound and pits as per instructions

70.25 A Road bears N 80° W & S 80° E

4 BOOK 1 351

T 1 N Range 1 W

Gila & Salt River Meridian

8000 Set a post for cor to secs 25, 26. 35 & 36 with mound and pits as per instructions
Land level
Soil alkali
Thick mesquite brush

South bet secs 35 & 36
Va 13°20' E

4000 Set a post for 1/4 sec cor with mound and pits as per instructions

50.00 Enter dense arrowweed brush

76.50 To the right bank of Gila River about 10.00 chs wide. Rapid current - runs west

PCN: CS316P1
REPORT DATE: 04-06-93

N316

ARIZONA

U.S. DEPT OF INTERIOR - BUREAU OF LAND MANAGEMENT

B L M CADASTRAL SURVEY FIELD NOTES

RECTANGULAR SURVEY INDEX

TOWNSHIP 26 NORTH RANGE 25 EAST MERIDIAN

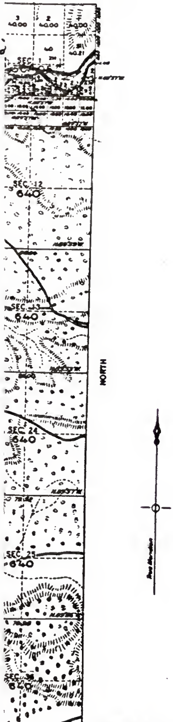
BOUNDARY	VOLUME	INTRODUCTION FROM	INTRODUCTION TO	SURVEY FROM	SURVEY TO	CERTIFICATE FROM	CERTIFICATE TO	TYPE	CONTRACT OR GROUP	ISSUED OR APPROVED	SURVEY YEAR	SURVEY APPROVED	SURVEYOR OR REMARKS
NORTH	R1874	1	5	19	19	23	25	ORG	106	04/16/1903	1904	07/12/1906	DAY
NORTH	R2959	1	10	24	26	67	69	RES		06/01/1914	1915	06/20/1917	MILLER
NORTH	R2959	1	10	47	48	67	69	ORG		06/01/1914	1915	06/20/1917	MILLER
NORTH	R2959	1	10	53	57	67	69	ORG		06/01/1914	1915	06/20/1917	MILLER
NORTH	R5354	1	4	4	10	93	94	RES	715	11/22/1989	1990	04/28/1992	OLVER ETAL
SOUTH	R2959	1	10	10	10	67	69	ORG		06/01/1914	1915	06/20/1917	MILLER
SOUTH	R2959	1	10	38	39	67	69	ORG		06/01/1914	1915	06/20/1917	MILLER
SOUTH	R2959	1	10	49	52	67	69	ORG		06/01/1914	1915	06/20/1917	MILLER
EAST	R1874	1	5	19	19	23	25	ORG	106	04/16/1903	1904	07/12/1906	DAY
EAST	R2959	1	10	10	10	67	69	ORG		06/01/1914	1915	06/20/1917	MILLER
EAST	R2959	1	10	20	26	67	69	ORG		06/01/1914	1915	06/20/1917	MILLER
EAST	R5354	1	4	4	4	93	94	RES	715	11/22/1989	1990	04/28/1992	OLVER ETAL
WEST	R2959	1	10	38	48	67	69	ORG		06/01/1914	1915	06/20/1917	MILLER
WEST	R5354	1	4	9	10	93	94	RES	715	11/22/1989	1990	04/28/1992	OLVER ETAL
SUBDIVISION	R1957	1	3	23	27	36	41	ORG		11/13/1884	1885	03/07/1885	EVANS
SUBDIVISION	R2959					68	69	ORG		06/01/1914			MILLER
SUBDIVISION	R2960	1	10	10	169	181	184	ORG		06/01/1914	1915	06/20/1917	MILLER
SUBDIVISION	R2960	1	10	170	181	181	184	ORG		06/01/1914	1915	06/20/1917	MEANDERS
INDIAN RES.	R1957	1	3	23	27	36	41	ORG		11/13/1884	1885	03/07/1885	NAVAJO

NOTE: AN * IN THE UPPER RIGHT-HAND CORNER OF THE MICROFICHE INDICATES THE LAST FICHE OF THE TOWNSHIP SET
****

MERIDIAN, ARIZONA.

1150

FILED 11-24-1917



Latitude 35°35'35"
Longitude 109°37'09" W

SU
...NSHIP NO. 26 NORTH RANGE NO. 25 EAST OF THE GILA AND SALT
ST ...IA, IS STRICTLY CONFORMABLE TO THE FIELD NOTES OF THE SURVEY
TO ...'S OFFICE, WHICH HAVE BEEN EXAMINED AND APPROVED.
SU
HE ...D OFFICE
BO
...NE 20, 1917.

Commissioner.

Book "B"

FIELD NOTES

OF THE SURVEY OF THE

Subdivision and Meander Lines

of

TOWNSHIP 26 NORTH RANGE 25 EAST

Navajo Indian Reservation

Of the Gila and Salt River Base and *Meridian,*

In the State of Arizona

EXECUTED BY

Frederick C. Miller

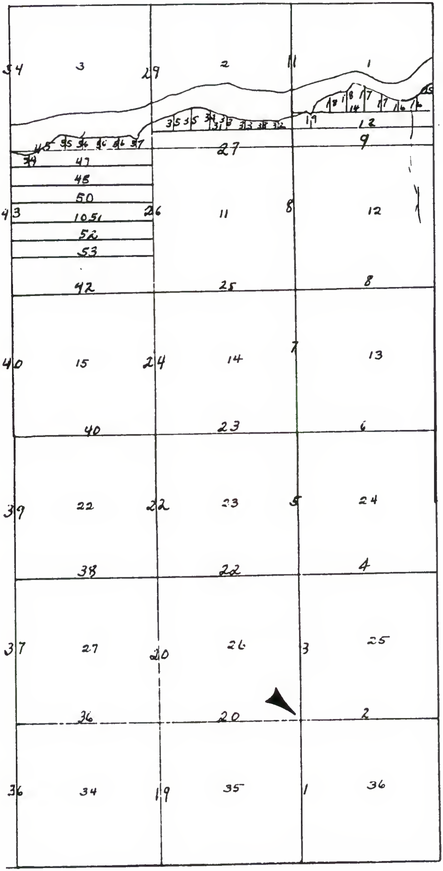
In the capacity of U.S. Surveyor, *under instructions dated* June 1, Aug. 10, *191*4,
Commissioner of the General Land Office to A.P.Dunnington,
issued by the ~~*United States Surveyor General to govern surveys included in*~~
Topographer in Charge of Indian Surveys,
~~*Group No.*~~ ......, ~~*which were approved by the Commissioner of the General Land*~~
~~*Office,*~~ ......, ~~*191*~~

Survey commenced August 21, *191*5

Survey completed September 23, *191*5

T. 26 N., R. 25 E.

1A


34
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1C

Subdivision of Township 26 N., Range 25 E.

Chains

Survey commenced August 21, 1915, by Fred'k. C. Miller, U. S. Surveyor, and executed with Young and Sons' light mountain transit No. 8248, with solar attachment. The horizontal limb is provided with two double opposite verniers reading to single minutes of arc, which is also the least count of the verniers of the latitude and declination arcs.

The iron posts used in this survey are regular land office iron posts 36 inches long filled with cement, set 26 inches in the ground and fitted with brass caps on which the proper numbers, letters, etc., are properly stamped.

Polaris observation taken at my camp in section 16, T. 26 N., R. 25 E., long. 109° 40' W., lat. 35° 36'. August 21, 1915, at 9^h 37^m p.m., l.m.t., I observe Polaris at eastern elongation and mark a point in the line thus determined by a tack in a stake driven in the ground about 10 chs. northerly from my station.

August 22, 1915. At 8^h a.m., l.m.t., I turn off the azimuth of Polaris 1° 24' to the left or W. and mark the meridian thus determined by a tack in a stake driven in the ground about 10 chs. N. of my station. The meridian obtained is used to make frequent tests of the solar while at work in T. 26 N., R. 25 E.

August 23, 1915. At 8^h a.m., l.m.t., I set off 35° 36' on lat. arc, 11° 43' N. on decl. arc, and determine a meridian with the solar at the cor. of secs. 1, 2, 35 and 36, on S. bdy. of tp., previously described.

Thence I run

N. 0° 1' W. bet. secs. 35 and 36.

Over rolling sage brush land through scattering cedar and pinon.

40.00 Set an iron post 1 in. dia., for ¼ sec. cor. bet. secs. 35 and 36, with brass cap stamped

¼ in N.
S 35 in W.
S 36 in E.
1915 in S.

From which a

Chains

Pinon 8 ins. dia., brs. N. 84° E., 40 lks. dist.; mkd. ¼ S 36 B T.

Pinon 10 ins. dia., brs. S. 62° 30' W., 43 lks. dist., mkd. ¼ S. 35 B T.

42.40 Edge of mesa brs. E. & W.

Begin steep descent.

45.00 Foot of steep descent, brs. E. & W.

Continue gradual descent over rolling sage brush land, through scattered cedar and pinon.

80.00 Set an iron post 2 ins. dia., for cor. of secs. 25, 26 35 and 36, with brass cap stamped

T 26 N S 26 in NW.
R 25 E S 25 in NE.
S 36 in SE.
S 35 in SW.
1915 in S.

From which a

Cedar 26 ins. dia., brs. S. 35½° E., 50 lks. dist., mkd. T 26 N R 25 E S 36 B T

Pinon 8 ins. dia., brs. S. 72½° W., 90 lks. dist., mkd. T 26 N R 25 E S 35 B T.

No other trees available.

Pits and mound impractical.

Land, rough and rolling. (grazing)
Soil, 3rd rate.
Timber, scrub cedar and pinon (scattered).

S. 89° 57' E. on a random line bet. secs. 25 and 36.

40.00 Set temp. ¼ sec. cor.

79.98 Fall 3 lks. N. of cor. of secs. 25, 30, 31 and 36.

Thence I run

N. 89° 56' W. on a true line bet. secs. 25 and 36.

Over rolling land ascending through scattering timber.

1.00 Top of ascent, brs. N. & S.

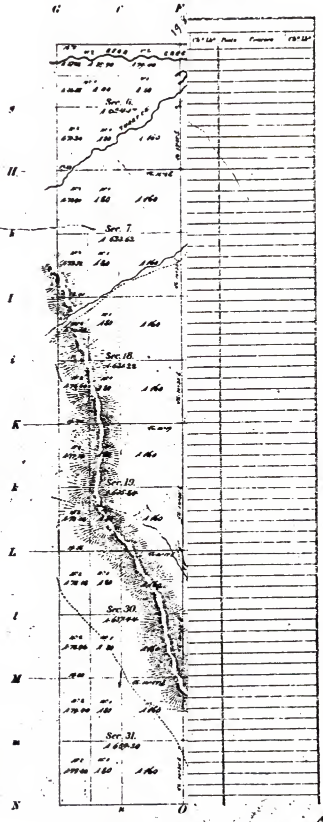
Desc. over rolling broken land.

39.99 Set an iron post 1 in. dia., for ¼ sec. cor. bet. secs. 25 and 36, with brass cap stamped

¼ in W.
S 25 in N.
S 36 1915 in S.

From which a

TOWNSHIP Nº)K 3



Surveys Designated	By Wh
Township lines	Joel E
Subdivisions	Willia
Correction line Nº 1 South	Joel E

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1141                          UNITED STATES DEPARTMENT OF THE INTERIOR                          PAGE    1

                                     BUREAU OF LAND MANAGEMENT

COLORADO                            RECTANGULAR SURVEY INDEX                        PRINTED: 02/24/76

          TOWNSHIP  5     SOUTH  RANGE  69      WEST                            -SIXTH PRIN MER
BOUNDARY   VOLUME INTRODUCTION    SURVEY  CERTIFICATE TYPE CONTRACT  ISSUED OR     SURVEY

                  FROM     TO  FROM     TO  FROM     TO      OR GROUP  APPROVED     YEAR  APPROVED   SURVEYOR OR REMARKS

NORTH        RO       1      2    68     69   144    148  ORG      5   10/01/1861  1861  11/04/1861 J E HENDRICKS
NORTH        RO       1      2    79     89   144    148  ORG      5   10/01/1861  1861  11/04/1861 J E HENDRICKS
NORTH        RO486  185    187   187    188   195    196  RES    470   11/28/1961  1961  05/03/1962 A ARNOLD

SOUTH        RC     121    121   141    145   146    150  ORG      1   08/12/1861  1861  10/01/1861 J E HENDRICKS
SOUTH        RL      89     89   223    224   246    251  ORG          10/20/1864  1865  09/26/1865 A L SHELDON
SOUTH        R-C      1      1     1      1   123    127  ORG          06/21/1867  1867  09/20/1867 G HILL
SOUTH        RO487  455    457   466    467   493    494  RES    540   10/24/1966  1967  09/25/1967  SCOTT& LIVRMR
SOUTH        RO487  455    457   474    475   493    494  RES    540   10/24/1966  1967  09/25/1967  SCOTT& LIVRMR
SOUTH        RO487  455    457   482    483   493    494  RES    540   10/24/1966  1967  09/25/1967  SCOTT& LIVRMR
SOUTH        RO487  495    497   501    501   519    520  RES    540   10/24/1966  1967  09/25/1967  LIVERMRE&BGLW
SOUTH        RO487  521    523   525    526   531    532  RES    540   10/24/1966  1967  09/25/1967 J SCOTT
SOUTH        RO487  533    535   536    539   545    546  RES    540   10/24/1966  1967  09/25/1967 J SCOTT

EAST         RC     121    121   141    141   146    150  ORG      1   08/12/1861  1861  10/01/1861 J E HENDRICKS
EAST         RD       1      2    66     69   144    148  ORG      5   10/01/1861  1861  11/04/1861 J E HENDRICKS
EAST         RO487  521    523   525    527   531    532  RES    540   10/24/1966  1967  09/25/1967 J SCOTT

WEST         RC     121    121   145    145   146    150  ORG      1   08/12/1861  1861  10/01/1861 J E HENDRICKS
WEST         RD       1      2    76     79   144    148  ORG      5   10/01/1861  1861  11/04/1861 J E HENDRICKS
WEST         R-C                   1      1   123    127  ORG          06/21/1867  1867  09/20/1867 G H HILL

SUBDIVISION RI      284    287   287    323   325    327  ORG          04/14/1864  1864  05/02/1864 W ASHLEY
SUBDIVISION RO486   185    187   188    192   195    196  RES    470   11/28/1961  1961  05/03/1962 A ARNOLD
SUBDIVISION RO486   185    187   192    193   195    196  ORG    470   11/28/1961  1961  05/03/1962 A ARNOLD
SUBDIVISION RO487   533    535   539    542   545    546  RES    540   10/24/1966  1967  09/25/1967 J SCOTT
SUBDIVISION RO487   533    535   542    543   545    546  ORG    540   10/24/1966  1967  09/25/1967 J SCOTT

...................................................................................................................
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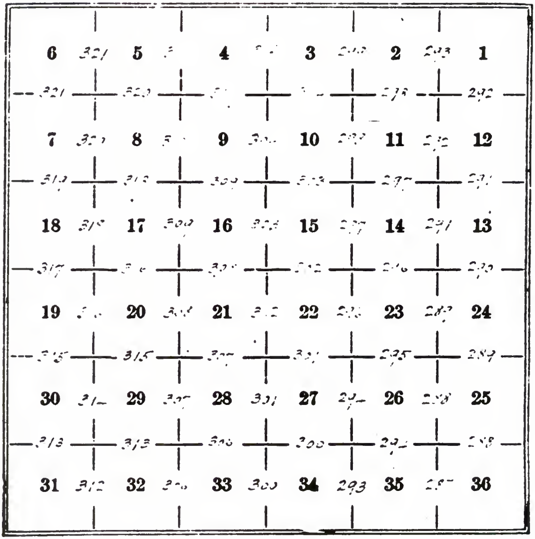
Field Notes
of
Township 5 S. R. 69 W.
in
Colorado

Survey commenced April 20th 1864 & completed April 26th 1864.

4-674.

Township *5 S.* **R.** *69 W.*



66.00 Road runs N 10° E.
70.00 Road runs N 30° W.
80.00 Intersected N & S line at cor. to
Sec. 2.3.10 & 11 from which
cor. I run

West on a true line bet. 3 & 10
Var 15° E.
40.00 Set Stone 14 X 9 X 3 for
1/4 Sec. cor.
80.00 Cor to Secs. 3.4.9 & 10
Land gently rolling 2nd rate.

North between Secs. 3 & 4
Var. 14° ~~40'~~ 45' E
40.00 Set temporary post
80.00 Intersecting N boundary 66 lks
W of cor to secs. 3 & 4 from
which cor I run
South on a true line
Var 14° 17' E
40.00 Set sandstone 18X10X5 for 1/4
Sec. cor.
8000 Cor of Secs 3, 4, 9 & 10

80.00 Cor to Secs 3.4.9&10
Land gently rolling 2d rate.
April 22d 1864

North betw Secs 32&33
Var 14°45' E.
20.40 Road runs N45°W
40.00 Set Sandstone 18x16x15, for
1/4 Sec. cor.
80.00 Set Sandstone 15x9x6 for cor
to Secs 29.28.32&33
Land rolling & stony 3d rate

East on a random line betw
Secs. 28&33
Var. 15°E.
29.30 Road runs S.70°W.
40.00 Set temporary 1/4 post
80.24 Intersected N&S line 20 lks N
of cor to Secs 27.28.33&34
from which cor. I run
West on a random line

Var 14°47' E

40.12 Set granite stone 16x12x4 for
1/4 Sec. cor.
80.24 Cor to secs 28. 29. 32 & 33
Land rolling 2d rate

North betw Secs 28 & 29
Var. 14°45' E

18.50 Road runs S 60° W.
22.50 Road " S 45° W.
40.00 Set sandstone 18x12x5 for
1/4 Sec. cor.
58.00 Dry run, runs E.
80.00 Set granite rock 18x7x5 for
cor to secs. 20. 21. 28 & 29
Land rolling 2d rate

East on random line betw
Secs 21 & 28
Var. 15° E.

29.30 Road runs N & S.
40.00 Set temporary post

79.60 Intersected N & S line 21 lks.
N. of cor. to Secs. cor to Secs
21, 22, 27 & 28 for which I
cor

West on a true line bet. 21 & 28
Var. 14°51' E

39.80 Set Conglomerate Stone 19×7×4
for ¼ Sec. cor.

79.60 Cor. to Secs 20. 21. 28 & 29
Land rolling 2d rate

North between Secs 20 & 21
Var. 14°45' E.

40.00 Set Sandstone 15×8×8. for ¼
Sec. cor.

80.00 Set Sandstone 18×12×3 for cor
to Secs 16, 17, 20 & 21
Land rolling 2d rate

East on a random line betw
Secs. 16 & 21.
Var 15° E

Form 9180-6
(April 1965)
(formerly 4-679)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

FIELD NOTES

OF THE
DEPENDENT RESURVEY OF
PORTIONS OF THE FIRST STANDARD PARALLEL SOUTH
AND SUBDIVISIONAL LINES
AND A SURVEY OF
SUBDIVISION OF CERTAIN SECTIONS
IN TOWNSHIP 5 SOUTH, RANGE 69 WEST

Of the SIXTH PRINCIPAL Meridian,

In the State of COLORADO.

EXECUTED BY

JAMES P. SCOTT CADASTRAL SURVEYOR

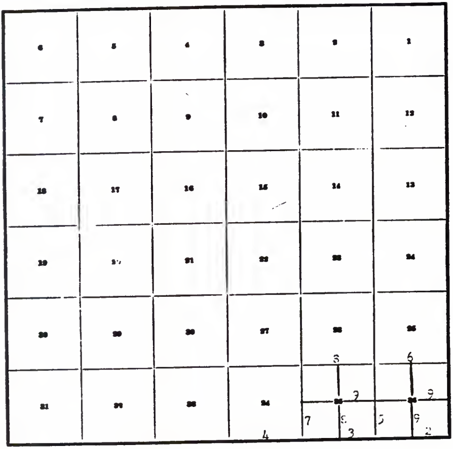
Under special instructions dated October 17, 1966, which provided for the surveys included under Group Number 540-4, approved October 24, 1966, and assignment instructions dated October 24, 1966.

Survey commenced November 1, 1966

Survey completed March 17, 1967

INDEX DIAGRAM

Township 5 South, **Range** 69 West.



Township 5 South, Range 69 West
Sixth Principal Meridian, Colorado

CHAINS

The following field notes are those of a dependent resurvey of portions of the First Standard Parallel South and subdivisional lines and a survey of subdivision of certain sections in Township 5 South, Range 69 West, Sixth Principal Meridian, Colorado.

History of Surveys

Original Surveys

First Stan. Par. S. and boundaries	Joel Hendricks	1861
Subdivision lines	William Ashley	1864

Resurveys

Portion of E. bdy.	James P. Scott	1966-67

Preliminary to the resurvey the lines of the original survey were retraced and a diligent search made for any evidence of the original corner positions. In the intervening years since the original survey, some of the corners have been remonumented with durable materials by county and private surveyors. These corner monuments are locally accepted as the true point for the corner positions. Information was also obtained from the Denver Water Board and U.S. Geological Survey, who in the period from 1938 to 1940 evaluated and referenced many corners in the area. In cases where physical evidence of the corner monument could not be found, improvements, such as section line roads and fences constructed before the original corner evidence was destroyed, were used to determine the corner position. Missing corners were reestablished according to the rules of proportionate measurement.

The resurvey was executed in accordance with the specifications set forth in the Manual of Surveying Instructions, 1947, and the special instructions dated October 17, 1966. The directions of all lines were determined by ties to Bureau of Reclamation triangulation station "Waterton" located in Section 22 of Township 6 South, Range 69 West. All lines refer to the true meridian. The adjusted horizontal distances, only, are entered in this field note record. All distances were measured with electronic measuring devices, therefore topography was only given in the vicinity of the corner monuments. For additional topography, see U.S. Geological Survey quadrangle "Littleton".

The geographic position of the standard cor. of Township 5 South, Ranges 68 and 69 West, as scaled from the U.S. Geological Survey quadrangle "Littleton" is:

Latitude 39° 34.0' N.
Longitude 105° 03.2' W.

The observed magnetic declination was 14° E.

Dependent Resurvey of a Portion
of the First Standard Parallel South
Township 5 South, Range 69 West
Sixth Principal Meridian, Colorado

CHAINS

Re-establishment of the Survey Executed by Joel Hendricks in 1861

From the standard cor. of T. 5 S., Rs. 68 and 69 W., monumented with an iron post, 2½ ins. diam., as described in the dependent resurvey of a portion of the First Standard Parallel South in T. 5 S., R. 68 W., executed concurrently with this group,

N. 89° 58' W., on the S. boundary of sec. 36.

Over rolling land.

1.94 The closing cor. of T. 6 S., Rs. 68 and 69 W.

39.99 The standard ¼ sec. cor. of sec. 36 monumented with a re-inforcing rod, 5/8 ins. diam., set 6 ins. below the surface of a dirt lane, set by Miner and Miner, Consulting Engineers, Greeley, Colorado, locally accepted as the corner monument.

At the corner point over the re-inforcing rod

Set a copper-coated steel stake, 30 ins. long, ½ in. in diam., 4 ins. below the surface of the ground, with brass cap, 1½ ins. diam., mkd.

S C
¼ S36
1966

from which

An iron post, 30 ins. long, 2½ ins. diam., set 24 ins. in the ground, for a reference monument, bears N. 43½° E., 36.3 ft. dist., with brass cap mkd. T5S R69W RM S36 36.3 FT 1966 and an arrow pointing to the true corner.

An iron post, 30 ins. long, 2½ ins. diam., set 24 ins. in the ground, for a reference monument, bears N. 37½° W., 32.5 ft. dist., with brass cap mkd. T5S R69W RM S36 32.5 FT 1966 and an arrow pointing to the true corner.

N. 89° 58' W., beginning new measurement.

Over rolling land

1.75 The ¼ sec. cor. of sec. 1, T. 6 S., R. 69 W.

40.00 The standard cor. of secs. 35 and 36 monumented with a large-headed iron pin, ½ in. in diam., set 8 ins. below the surface of the road, as described in the U.S. Geological Survey corner evaluation of 1938-40.

from which

An X on a concrete fence post bears N. 72° W., 58.3 ft. dist.

An X on a concrete fence post bears N. 10½° W., 31.6 ft. dist.

At the corner point

Dependent Resurvey of a Portion
of the First Standard Parallel South
Township 5 South, Range 69 West
Sixth Principal Meridian, Colorado

CHAINS

Set a copper-coated steel stake, 30 ins. long, ½ in. in diam., 4 ins. below the surface of the road, with brass cap, 1½ ins. diam., mkd.

S C
S35|S36
1966

from which

> An iron post, 30 ins. long, 2½ ins. diam., set 24 ins. in the ground, for a reference monument, bears N. 72° W., 57.7 ft. dist., with brass cap mkd. T5S R69W RM S35 57.7 FT 1966 and an arrow pointing to the true corner.
>
> An X on a concrete fence post bears N. 10½° W., 31.6 ft. dist.,

Bury the pin alongside the steel stake.

N. 89° 56' W., on the S. boundary of sec. 35.

1.88 The closing cor. of secs. 1 and 2, T. 6 S., R. 69 W.

40.12 Point for the standard ¼ sec. cor. of sec. 35 at proportionate distance. There is no evidence of the original corner monument.

Set a copper-coated steel stake, 30 ins. long, ½ in. in diam., 4 ins. below the surface of the road, with brass cap, 1½ ins. diam., mkd.

T5S R69W
S C
¼ S35
1966

from which

> An iron post, 30 ins. long, 2½ ins. diam., set 24 ins. in the ground, for a reference monument, bears N. 39° E., 37.0 ft. dist.; with brass cap mkd. T5S R69W RM S35 37.0 FT 1956 and an arrow pointing to the true corner.
>
> An iron post, 30 ins. long, 2½ ins. diam., set 24 ins. in the ground, for a reference monument, bears N. 18° W., 30.3 ft. dist., with brass cap mkd. T5S R69W RM S35 30.3 FT 1966 and an arrow pointing to the true corner.

42.36 The ¼ sec. cor. of sec. 2, T. 6 S., R. 69 W.

80.24 The standard cor. of secs. 34 and 35 monumented with a re-inforcing rod, ¾ in. diam., set 6 ins. below the surface of the road, recovered and described by the Denver Water Board prior to 1938.

At the corner point

Set a copper-coated steel stake, 30 ins. long, ½ in. in diam., 4 ins. below the surface of the road, with brass cap, 1½ ins. diam., mkd.

CHAINS

T5S R69W
S C
S34 | S35
1966

from which

An iron post, 30 ins. long, 2½ ins. diam., set 24 ins. in the ground for a reference monument, bears N. 51¼° E., 41.3 ft. dist., with brass cap mkd. T5S R68W RM S35 41.3 FT 1966 and an arrow pointing to the true corner.

An X on the S. side of a concrete fence post bears N. 2½° W., 26.0 ft. dist.

Bury the re-inforcing rod alongside the steel stake.

N. 89° 53' W., on the S. boundary of sec. 34.

Over rolling land.

2.59 The closing cor. of secs. 2 and 3, T. 6 S., R. 69 W.

39.99 The standard ¼ sec. cor. of sec. 34 monumented with a large boulder split into three pieces with a re-inforcing rod, 1 in. diam., driven between the pieces, set 4 ins. below the surface of the road, as described in the U.S. Geological corner evaluation of 1938-40.

from which

An iron pipe, 1 in. diam., projecting 10 ins. above the surface of the ground, bears N. 52° E., 51.0 ft. dist.

An iron pipe, 1 in. diam., projecting 10 ins. above the surface of the ground, bears S. 61½° E., 40.8 ft. dist.,

An iron pipe, 1 in. diam., projecting 10 ins. above the surface of the ground, bears S. 84° W., 152.7 ft. dist.

At the corner point

Set a copper-coated steel stake, 30 ins. long, ½ in. in diam., 4 ins. below the surface of the road, with brass cap, 1½ ins. diam., mkd.

S C
¼ S34
1966

from which

An iron post, 30 ins. long, 2½ ins. diam., set 24 ins. in the ground, for a reference monument, bears N. 48° E., 39.4 ft. dist., with brass cap mkd. T5S R69W RM ¼S34 39.4 FT 1966 and an arrow pointing to the true corner.

An iron post, 30 ins. long, 2½ ins. diam., set 24 ins. in the ground, for a reference monument, bears N. 43° W., 34.3 ft. dist., with brass cap mkd. T5S R69W RM ¼S34 34.3 FT 1966 and an arrow pointing to the true corner.

CERTIFICATE OF SURVEY

I, **James P. Scott**, HEREBY CERTIFY upon honor that, in pursuance of special instructions bearing date of the 17th day of October, 1966, I have dependently resurveyed portions of the First Standard Parallel South, west boundary, subdivisional lines and surveyed subdivision of section 31, Township 5 South, Range 68 West

of the Sixth Principal Meridian, in the State of Colorado, which are represented in the foregoing field notes as having been executed by me and under my direction; and that said survey has been made in strict conformity with said special instructions, the Manual of Instructions for the Survey of the Public Lands of the United States, and in specific manner described in the foregoing field notes.

June 2, 1967
(Date)

James P. Scott
James P. Scott
(Cadastral Surveyor)

(Date)

(Cadastral Surveyor)

CERTIFICATE OF APPROVAL

SUBMITTED FOR APPROVAL
Date JUN 16 1967

BUREAU OF LAND MANAGEMENT,
Washington, D. C.

The foregoing field notes of the dependent resurvey of portions of the First Standard Parallel South, west boundary, and subdivisional lines and the survey of subdivision of section 31, Township 5 South, Range 68 West, Sixth Principal Meridian, Colorado

executed by James P. Scott

having been critically examined and found correct, are hereby approved.

SEP 25 1967
(Date)

(Chief, Division of Engineering)

CERTIFICATE OF TRANSCRIPT

~~I CERTIFY That the foregoing transcript of the field notes of the above-described surveys is~~

~~is a true copy of the original field notes.~~

~~(Date)~~

~~(Chief, Division of Engineering)~~

TOWNSHIP 5 S

d reestablishment
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tore the corners
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f subdivision of

approved May 3,

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Scott, beginning
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Group No. 540-4,

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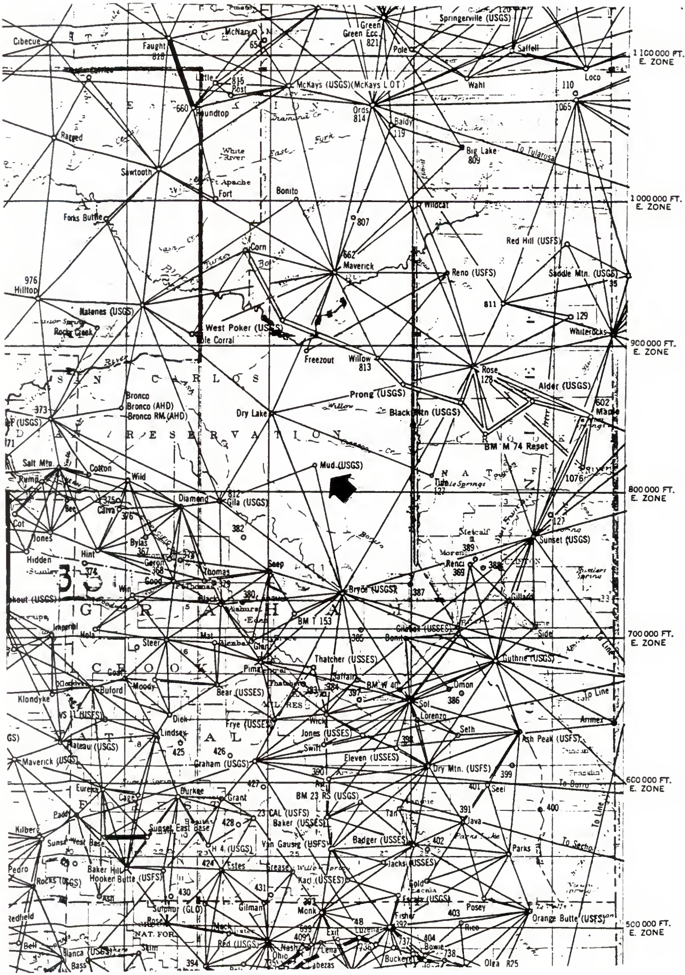
C.M.H.


Springerville (USGS)
Green
Green Ecc.
821
Cibecue
McNary
654
Faught
818
Pole
Saffell
1 100 000 FT. E. ZONE
Little
815
Post
McKays (USGS)(McKays L.O.T.)
Wahl
110
Loco
660
Roundtop
Ords
814
Baldy
119
1065
Ragged
White River
East Fork
Big Lake
809
To Tularosa
Sawtooth
Apache
Fort
Bonito
1 000 000 FT. E. ZONE
Wildcat
Forks Butte
807
Red Hill (USFS)
Corn
662
Maverick
Reno (USFS)
Saddle Mtn. (USGS)
35
976
Hilltop
811
129
Natanes (USGS)
Rocky Creek
West Poker (USGS)
Pole Corral
Whiterocks
900 000 FT. E. ZONE
Freezout
Willow
813
Rose
128
Alder (USGS)
S A N C A R L O S
Bronco
Bronco (AHD)
Bronco RM (AHD)
Prong (USGS)
Dry Lake
Black Mtn (USGS)
602
Maple
373
(USGS)
I N D I A N R E S E R V A T I O N
BM M 74 Reset
Salt Mtn.
Cotton
Wild
Mud (USGS)
Tule
127
1076
Rump
375
Calva
Bee
Diamond
812
Gila (USGS)
800 000 FT. E. ZONE
Cot
376
382
127
Jones
Bylas
Metcalf
389
Sunset (USGS)
Hidden
Hint
367
Geron
368
Morenci
Renci
369
388
374
Seep
Thomas
Good
Win
Pt Thomas
379
380
Black
Bryce (USGS)
387
Lookout (USGS)
G R A H A M
Ashurst
Eden
BM T 153
Gillard
Imperial
Hola
Steer
Mat
Bienbar
Glen
385
Glasco (USSES)
Bonit
Side
700 000 FT. E. ZONE
C R O O K
Coal
Pima
Thatcher (USSES)
Guthrie (USGS)
Klondyke
Buford
Moody
Bear (USSES)
Thatcher
383
384
Safford
BM W 40
397
Omon
386
Sol
Lorenzo
To Line
Dick
Wick
Seth
Armex
Lindsey
Jones (USSES)
Frye (USSES)
Swift
Ash Peak (USFS)
Plateau (USGS)
425
426
Eleven (USSES)
398
Maverick (USGS)
Graham (USGS)
Dry Mtn. (USFS)
399
390
427
401
Seel
600 000 FT. E. ZONE
To Burro
Eureka
Burkee
Grant
BM 23 RS (USGS)
Cage
23 CAL (USFS)
Tan
400
Paddy
391
Java
Sunset East Base
428
Baker (USSES)
Kilberg
Sunset West Base
Van Gausig (USFS)
Badger (USSES)
402
Parks
To Secho
H 4 (USGS)
Pedro
Baker Hill
Hooker Butte (USFS)
424
Estes
Grease
Jacks (USSES)
Rocks (USGS)
Karl (USSES)
Ash
430
431
Gold
Lacnia (USGS)
Posey
Redfield
Sulphur (GLO)
Gilman
393
Monk
Fisher
392
403
Orange Butte (USFS)
500 000 FT. E. ZONE
Rose
Mack
NAT. FOR.
699
409
Exit
48
Luzena
737
Rico
Bell
Red (USGS)
736
404
Bowie
Blanca (USGS)
Nash
Lena
738
394
Ohio
Bass
Cabezas
Buckeye
Olga
825

JULY 1966
PUBLISHED AND PRINTED BY:
U.S. DEPARTMENT OF COMMERCE
COAST AND GEODETIC SURVEY
WASHINGTON D.C.

HORIZONTAL CONTROL DATA

by the
Coast and Geodetic Survey
NORTH AMERICAN 1927 DATUM

QUAD 331093 STATION 1002
ARIZONA
LATITUDE 33°00' TO 33°30'
LONGITUDE 109°30' TO 110°00'
DIAGRAM NI 12-9, CLIFTON

U.S. DEPARTMENT OF COMMERCE
COAST AND GEODETIC SURVEY

DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION MUD (USGS) STATE. Arizona COUNTY. Graham

CHIEF OF PARTY M.E. Sylar YEAR. 1960 DESCRIBED BY: J.T.M.

NOTE.* HEIGHT OF TELESCOPE ABOVE STATION MARK 1.4 METERS.‡ HEIGHT OF LIGHT ABOVE STATION MARK METERS

Desc	SURFACE STATION MARK, UNDERGROUND-STATION MARK / DISTANCES AND DIRECTIONS TO AZIMUTH MARK, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION				
	OBJECT	BEARING	DISTANCE FEET	DISTANCE METERS	DIRECTION†
	BRYCE (USGS)				0 00' 00.0"
	Dry Lake Lookout Tower (Abandoned)	NW	(Approx.	9 miles)	158 14 32.6
Desc.	R.M. 1	NE	17.98	5.480	250 28 40
Desc.	R.M. 2	S	18.61	5.672	355 15 39

Detailed description

Station is located on the highest and most southerly point of a long east-west ridge about 30 miles northwest of Clifton, 7 miles south of the Point of Pines Camp, and 6 miles east of Arsenic Tubs Ranch. This point is the highest point visible to the east from the ranch.

Reached from the Post Office in San Carlos by going south on macadam road for 1.65 miles to a side road left, turn left on graveled road for 0.4 mile to forks, take left fork and continue on graveled road for 17.15 miles to forks, take right fork as per sign "Arsenic Tubs" for 9.0 miles to forks, take right fork, southeast and east, for 13.65 miles to Arsenic Tubs Ranch. To reach the station from the ranch buildings by horses go east on dirt road for about 2 miles to a gate then east along the north side of a fence for about 3 miles to gate in an east-west fence about 100 yards north of a T-fence corner, then east-northeast passing pond and head east-northeast across pasture, passing catch pens, about ½ mile below the rim of the ridge, at this point there is a dim trail leading east from the catch pen, follow trail east for about ½ mile to the second canyon leading from ridge, follow trail up this canyon to top of saddle and wire gate, pass through gate, turn sharp left, and follow fence west to end of fence, continue west keeping to south edge of hill for about 1½ miles to point where ridge turns sharp right, north, and station on the highest point. About 3½ hours horse pack from ranch.

Station mark is a U.S. Geological Survey bench mark disk, stamped MUD 1958, cemented in a drill hole in a boulder projecting 14 inches.

Reference mark 1 is a U.S. Geological Survey reference mark disk, stamped MUD NO 1 1958, cemented in a drill hole in a boulder projecting 16 inches. It is the same elevation as the station mark.

Reference mark 2 is a U.S. Geological Survey reference mark disk, stamped MUD NO 2 1958, cemented in a drill hole in a boulder projecting 2 feet. It is the same elevation as the station mark.

Note: Mr. George Stevens, manager of the Arsenic Tubs Ranch, said he would be glad to assist in any way anyone trying to reach this station.

---

*Refers to notes in manuals of triangulation and state publications of triangulation. †Direction-angle measured clockwise, referred to initial station
‡To nearest meter only, when no trigonometric leveling is being done.

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: MUD (USGS) YEAR: 1960

STATE: Arizona LOCALITY: Fort Apache Indian Reservation

Second-ORDER Triangulation SOURCE: G-12425 FIELD SKETCH: Ariz. 37-II

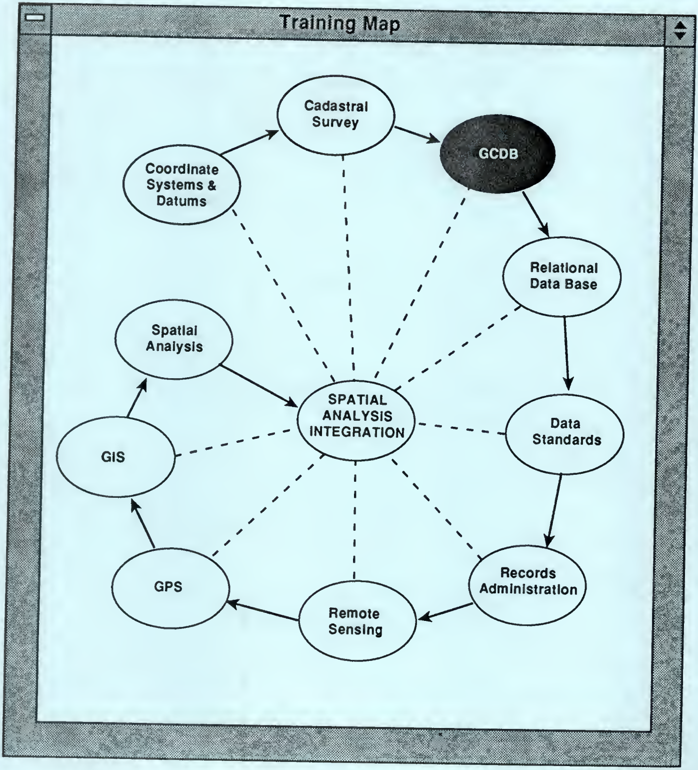
GRID DATA	COORDINATES (Feet)	PLANE AZIMUTH (OR Δα) ANGLE	MARK
STATE: Ariz. ZONE: E CODE: 0201	x 631,875.75 y 822,025.00	+ 0° 14' 12"	
STATE: ZONE: CODE:	x y		

GEODETIC DATA	POSITION		SECONDS IN METERS	ELEVATION
	LATITUDE: 33° 15' 32".5721 NORTH			2222.8 METERS
	LONGITUDE: 109 44 06.9098 WEST			7293 FEET

TO STATION	GEODETIC AZIMUTH (From south)	DISTANCE (Meters)
	SECOND-	ORDER
GILA USGS	70°13'34".91	21,413.755
BRYCE USGS	347 24 22.35	27,178.172

BLM Library
Denver Federal Center
Bldg. 50, OC-521
P.O. Box 25047
Denver, CO 80225

GEO - DATA COLLECTION & USE
(for Ecosystem Based Management)



Course No. 1730-11

BLM Library
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P.O. Box 25047
Denver, CO 80225

GCBD

LESSON OBJECTIVE

By using GCDB coordinate data the Trainee will be able to:

☞ correctly identify a monument search area in the field.

☞ determine how to utilize GCDB data for a field project tool.

The Geographic Coordinate Data Base

The following information will help you more fully understand how the Geographic Coordinate Data Base can tie your information to its framework.

BLM's Land Information System (LIS) concept is designed in layers with a Geographic Coordinate Data Base, or GCDB, as its framework. The GCDB will contain latitude and longitude coordinate values and other descriptive information for corner positions and monuments recorded in the Public Lands Survey System. These coordinates can be easily converted to Universal Transverse Mercators (UTMs) or state plane values.

A computer can use coordinate values and descriptive information, called attributes, to depict a specific parcel of land on a screen or automated plotter. However, the GCDB is much more than a data base to support computer-aided mapping on a national scale. It is designed to be a framework which anchors data to the legal description of the land and its position on the earth's surface. The anchor points for the GCDB framework will be the coordinate values of parcel corners.

With the Public Land Survey data displayed from the first framework layer, BLM is designing the second layer of its LIS to automatically display data from the national land and mineral records. This Automated Land and Mineral Record System (ALMRS) includes information on land ownership status and use authorizations such as oil and gas leases, mining claims, rights-of-way, and more. The system will automate information presently found in BLM Public Rooms, including Master Title Plats and Historical Indexes.

The top layers will eventually hold a variety of resource data. For large land management agencies such as BLM, this includes natural and cultural resource data depicting soils, wetlands, archaeological sites, forest and grazing lands, mineral deposits, and other diverse resources.

BLM will use its future Land Information System to analyze data for resource management decisions related to processing lease applications, establishing utility corridors, and locating wildlife habitat improvements — to name a few typical multiple use issues. The LIS will allow the Bureau to analyze alternatives that combine several conflicting resource uses and goals. Currently BLM has separate records management and geographic information system capabilities that are not integrated into a Land Information System.

A high priority for BLM is data sharing to generate consistency and reduce duplication. State, county, and local governments have planning and management data relating to topics such as utility corridors, streets, zoning, taxes, and population. These agencies could take advantage of the opportunity to tie this data to the Bureau's GCDB and land status layers.

What makes BLM's Land Information System unique—different from existing geographic information systems—is the GCDB framework, which not only links resource, land status, and survey data to each other on a nationwide scale, but also anchors them to points on the earth's surface.

The Geographic Coordinate Data Base will provide a consistent format that will be used by the Bureau's LIS and can also be used for a variety of other automated systems. The format will provide the link to match map and graphic data with accurate positional coordinates for parcel corners as taken from legal land descriptions.

This basic GCDB layer is designed to utilize the most accurate and complete data available from many sources and technologies—from Federal, State, and local survey records; through global positioning by satellites; and from other sources. BLM will evaluate and select the most appropriate information and prepare it for data entry.

During initial data collection for the GCDB, it may not be economically feasible or even possible to obtain information from all survey and positional sources. However, today's technology allows for GCDB data to be corrected and supplemented as new information becomes available. The addition of more accurate information could ripple throughout the GCDB to improve numerous coordinate values.

The GCDB will enable BLM to replace paper maps and notes with automated maps which can be easily updated, displayed, copied, and manipulated in conjunction with other overlying data bases. It will display the most current data available at any given point in time. Other agencies will be able to access this data base through a BLM automated public room or from copies of computer files on tapes or disks.

The GCDB is a dynamic data base which forms the framework for a powerful decision-making tool that replaces time-consuming manual efforts.

BLM's Land Information System, with GCDB as its framework, is being designed to meet the future needs of our nation—a foundation upon which other Federal, State and local agencies, along with private industry, may build their own land information systems.

☆ U.S. Government printing office: 1989-773-858

GCDB HISTORY AND DEVELOPMENT

"The Data Base for your Resource Data Base"

The *Geographic Coordinate Data Base (GCDB)* project came into being because of the need for a common frame of reference for resource data. GCDB uses geographic cooordinates and land parcel data, which is based on the Public Land Survey Survey System (PLSS). The GCDB project assigns geographic coordinate values to cadastral survey corners, allowing resource data and land parcel data to be combined and graphically portrayed. Thus, GCDB becomes the "skeleton" of the BLM GIS System.

The locations of resource data (e.g., wildlife habitat, archeological sites, etc.) can be determined with sufficient accuracy by using a variety of techniques. Many resources can be photographed and/or map spotted with reasonable accuracy and then digitized from USGS quadrangle maps to obtain geographic coordinates.

The PLSS cannot be photographed and mapped as easily as the more visible resource data. In most cases, it is necessary to map the surveyed land net to a higher degree of accuracy to correctly portray the land parcel data. This is accomplished by combining the best geometric information (surveys) available and refining it to represent the best available picture of what exists on the ground.

The method that BLM is engaged in to produce the data base "skeleton" is the *Geographic Measurement Management (GMM)* set of programs.

GEOGRAPHIC MEASUREMENT MANAGEMENT

Geographic Measurement Management (GMM) was developed to satisfy the need for an accurate and complete set of geographic coordinate data for the Public Lands Survey System (PLSS) corners.

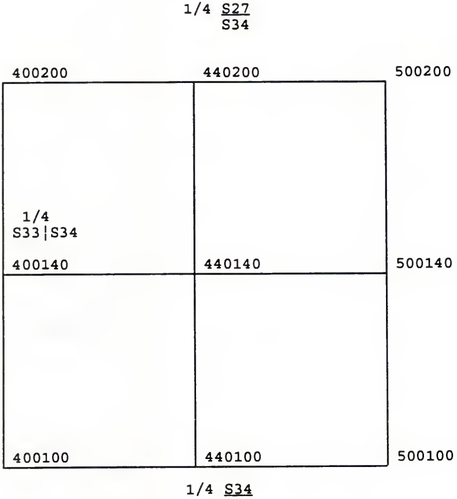
GCDB Point Identifiers

100700	200700	300700	400700	500700	600700	700700
Sec. 6 100600	Sec. 5 200600	Sec. 4 300600	Sec. 3 400600	Sec. 2 500600	Sec. 1 600600	700600
Sec. 7 100500	Sec. 8 200500	Sec. 9 300500	Sec. 10 400500	Sec. 11 500500	Sec. 12 600500	700500
Sec. 18 100400	Sec. 17 200400	Sec. 16 300400	Sec. 15 400400	Sec. 14 500400	Sec. 13 600400	700400
Sec. 19 100300	Sec. 20 200300	Sec. 21 300300	Sec. 22 400300	Sec. 23 500300	Sec. 24 600300	700300
Sec. 30 100200	Sec. 29 200200	Sec. 28 300200	Sec. 27 400200	Sec. 26 500200	Sec. 25 600200	700200
Sec. 31 100100	Sec. 32 200100	Sec. 33 300100	Sec. 34 400100	Sec. 35 500100	Sec. 36 600100	700100

GCDB Point Identifiers

100700	200700	300700	400700	500700	600700	700700
Sec. 6 100600	Sec. 5 200600	Sec. 4 300600	Sec. 3 400600	Sec. 2 500600	Sec. 1 600600	700600
Sec. 7 100500	Sec. 8 200500	Sec. 9 300500	Sec. 10 400500	Sec. 11 500500	Sec. 12 600500	700500
Sec. 18 100400	Sec. 17 200400	Sec. 16 300400	Sec. 15 400400	Sec. 14 500400	Sec. 13 600400	700400
Sec. 19 100300	Sec. 20 200300	Sec. 21 300300	Sec. 22 400300	Sec. 23 500300	Sec. 24 600300	700300
Sec. 30 100200	Sec. 29 200200	Sec. 28 300200	Sec. 27 400200	Sec. 26 500200	Sec. 25 600200	700200
Sec. 31 100100	Sec. 32 200100	Sec. 33 300100	Sec. 34 400100	Sec. 35 500100	Sec. 36 600100	700100

GCDB Point Identifiers



SECTION 34

GCDB - GMM PRODUCTION FILES

.CON

.DEF

.RAW

.SID

.PGC

GMM PRODUCTION FILES

CON This file contains the control that is going to be used to compute the coordinates for the township. This file can be supplied to the surveyor or created by the surveyor when INRAW is run. The file has the following information:

- the GCDB ID or grid number
- the latitude
- the longitude
- the elevation (5000.000 standard)
- the northing error estimate
- the easting error estimate
- the source of the control used

DEF This file contains the identity of the township which is to be computed. A program called PROJ (project) is used to call up the .DEF file for use or can be used to create a .DEF file. The file has the following information:

- the township and range
- the Principal Meridian
- the State
- the state plane zone
- the project elevation
- the default error estimates
- are elevations used
- are .SD error estimates used
- are error ellipses computed
- is a readjustment to be done
- UTM zone

RAW This files contains the survey data as input by the surveyor used to compute coordinates from one point to another within a township. The file has the following information:

- "From" GCDB ID
- "To" GCDB ID
- distance in chains
- quadrant of bearing (1=NE, 2=SE, 3=SW, 4=NW)
- bearing (degrees, minutes, seconds)
- SID number

SID This file contains the source ID's and error estimates of surveys for the township. The file has the following information:

- S (code to identify a SID)
- source identifier
- error estimates used in adjustment process
- survey information description

PGC This file contains the final adjusted coordinates of **all** computed positions int the township. The file has the following information:

- the GCDB ID for the corner position
- the latitude
- the longitude
- the elevation (if computed)
- standard error of adjusted coordinates for northing and easting

T055R69W.CON

```
  TWP 0050S  RNG 0690W  PM 7TH                  Colorado(CO)    DATE 95/01/03
 ORIGIN     000000.0000 0000000.0000 5000.000   0    0  2000.0000 5000.0000
 100100     393400.3245 1050956.0877 5000.000  23   23  0050S0690W07 Up GCDB
  00100     393400.3299 1050848.6835 5000.000  23   23  0050S0690W07 Up GCDB
   0100     393400.3354 1050741.2794 5000.000  23   23  0050S0690W07 Up GCDB
   7100     393400.1707 1050636.5974 5000.000  88   88  0060S0690W07 Dn GCDB
 400100     393400.1560 1050633.8760 5000.000  23   23  0050S0690W07 Up GCDB
 400200     393452.3270 1050633.8760 5000.000  23   23  0050S0690W07 Up GCDB
 400300     393544.4780 1050633.8760 5000.000  88   88  0050S0690W07 Up GCDB
 400400     393636.6686 1050633.8760 5000.000  88   88  0050S0690W07 Up GCDB
 497100     393400.0864 1050528.9238 5000.000  88   88  0060S0690W07 Dn GCDB
 500100     393400.0830 1050526.7416 5000.000  23   23  0050S0690W07 Up GCDB
 597100     393400.0289 1050420.6773 5000.000  88   88  0060S0690W07 Dn GCDB
 600100     393400.0275 1050419.1354 5000.000  23   23  0050S0690W07 Up GCDB
 700100     393400.0000 1050312.0000 5000.000   3    3  0050S0690W07 Up GCDB
```

T055R69W.DEF

```
PROJECT IS           t05sr69w
(1) t05sr69w                                <TOWNSHIP AND RANGE>
(2) 6                                       <PRINCIPAL MERIDIAN>
(3) colo                                    <STATE OR LOCAL DESIGNATION>
(4)  61 COLORADO CENTRAL LAMBERT            <STATE PLANE ZONE>
(5) PROJECT ELEVATION IS      5000.00 FT.


DEFAULT STANDARD ERROR ESTIMATES
    DISTANCES      .1 FT.  PLUS  1000. PPM (1/  1000. OR       5.4 FT./ MILE)
    ANGLES   0- 0- 4.0 (D-M-S)
(8) BEARINGS   0- 2-  .0 (D-M-S)
(9) CONTROL NORTHING (Y)          .001 FT.
(10) CONTROL EASTING (X)          .001 FT.
(11) ELEVATIONS READ FROM .LEV FILE ?        - - NO
(12) ERROR ESTIMATES READ FROM .SD FILE ?    - - YES
(13) ERROR ELLIPSES COMPUTED ?               - - NO
(14) READJUST WITH ROBUSTED ERROR ESTIMATES ? - - NO
(15) UTM ZONE = # 13
INPUT THE # OF THE ITEM TO CHANGE
ENTER IF NO CHANGE IS DESIRED (QUIT)

DO YOU WANT TO CHANGE THE PROJECT (JOB) Y/N ? <N>
```

T055R69W.SID

```
S1900                   .250    35.0   945.0   30.000   30.000
C      1861 HENDRICKS
S2922                   .250    35.0   945.0   30.000   30.000
C      1861 ASHLEY
  '90                   .250    25.0     5.0   23.000   23.000
       1966 SCOTT
S9999999                .250    25.0     5.0   23.000   23.000
C      1994 GPS
S9999999-TIE            .250    25.0     5.0   23.000   23.000
C      1994 GPS
```

```
t05sr69w                7                          colo
11111         0.000               0.000    5000.000   1  1
999999
        FROM        TO       DIST            BEARING      SID
100100      100200     80.000   1            .0 1900
100200      100300     80.000   1            .0 1900
100300      100400     80.000   1            .0 1900
100400      100500     80.000   1            .0 1900
100500      100600     80.000   1            .0 1900
100600      100700     80.000   1            .0 1900
200100      200200     80.000   1            .0 2922
200200      200300     80.000   1            .0 2922
200300      200400     80.000   1            .0 2922
200400      200500     80.000   1            .0 2922
200500      200600     80.000   1            .0 2922
200600      200640     40.000   1            .0 2922
200640      200660     20.000   1            .0 2922
200660      200700     19.800   1            .0 2922
300100      300200     80.000   1            .0 2922
300200      300300     80.000   1            .0 2922
300300      300400     80.000   1            .0 2922
300400      300500     80.000   1            .0 2922
300500      300600     80.000   1            .0 2922
300600      300640     40.000   1            .0 2922
300640      300660     20.000   1            .0 2922
300660      300700     19.750   1            .0 2922
400100      400200     80.000   1            .0 2922
400200      400300     80.000   1            .0 2922
400300      400400     80.000   1            .0 2922
400400      400500     80.000   1            .0 2922
400500      400600     80.000   1            .0 2922
400600      400640     40.000   1            .0 2922
400640      400660     20.000   1            .0 2922
400660      400700     20.000   1            .0 2922
500100      500140     40.000   1        3900.0 9790
500140      500200     40.000   1        3900.0 9790
500200      500300     80.000   1            .0 2922
500300      500400     80.000   1            .0 2922
500400      500500     80.000   1            .0 2922
500500      500600     80.000   1            .0 2922
500600      500640     40.000   1            .0 2922
500640      500660     20.000   1            .0 2922
500660      500700     20.050   1            .0 2922
600100      600140     40.020   1         400.0 9790
600140      600200     40.020   1         400.0 9790
600200      600300     80.000   1            .0 2922
600300      600400     80.000   1            .0 2922
600400      600500     80.000   1            .0 2922
600500      600600     80.000   1            .0 2922
600600      600640     40.000   1            .0 2922
600640      600660     20.000   1            .0 2922
600660      600700     20.000   1            .0 2922
700100      700140     40.100   1        3000.0 9790
700140      700200     40.110   1        3100.0 9790
700200      700300     80.000   1            .0 1900
700300      700400     80.000   1            .0 1900
700400      700500     80.000   1            .0 1900
700500      700600     80.000   1            .0 1900
700600      700700     80.000   1            .0 1900
700100      697100      1.940   4      895800.0 9790
697100      640100     38.050   4      895800.0 9790
```

GMM PRODUCTION PROGRAMS

INRAW Getting the information from the survey plats and notes, or abstraction sheets into the computer. This consists of:

- Adding plat data for rectangular surveys; beginning and continuing
- Switching SIDs to indicate another survey is beginning
- Importing data from boundaries of adjacent townships
- Adding plat data from special surveys or complex rectangular surveys
- Importing control from the .CON file
- Listing data on the screen to review and verify work done
- Editing or deleting data
- Adding to, changing or deleting control data
- Adding to, changing or deleting SID data
- Changing distance data format
- Quitting the program

INRAW also produces three files; the .Raw file, the .SD file and the .LSA file.

- .RAW contains all input raw data from plats, notes, etc.
- .SD file contains error estimates for all points in .RAW file (from .SID file)
- .LSA file contains the control coordinates used, distances from point to point, bearings used from point to point, and azimuths used to compute coordinates

GEN This program uses the raw data and forms traverses around sections and other surveys, performs a compass rule adjustment wherever possible, and computes approximate coordinates. It produces two files; the .GEN file and a new .LSA file.

- .GEN is a readable file showing misclosures of the surveys
- .LSA is the same file as INRAW produced plus a list of computed coordinates

LS386 This program performs a least square adjustment on the survey data and all the control points used to compute the township. LS386 reads the .SD file to determine how much relative adjustment to apply to the survey data. It produces one file; the .ADJ file.

- .ADJ lists how much each measurement had to adjust (residual), comparisons (SNOOP) between the residuals, and the error estimates from the .SID files. This file is used to track down any data entry and/or control blunders and to help gage the quality of the survey data and control data

APROP This program calculates the parentheticals and subdivides the sections in a normal township with standard survey rules, utilizing normal GCDB IDs. In unusual situations, APROP expects the surveyor to spell out how to do the subdivision. The results of these instructions are stored in two files; the .IRR file and the .ADD file. APROP uses these stored instructions to do the subdivion correctly. APROP also produces the .SUB file.

GCDB - GMM PRODUCTION PROGRAMS

INRAW

GEN

LS386

APROP

DXFLSA

- .IRR is where the surveyor tells APROP where the irregular sections are, which corners not to compute, which corners are to be proportioned using specified distances, and sections that are lotted against an offset interior line
- .ADD is where the surveyor adds computations for intersections, computations at specified bearings and distances, specified proportions, and can compute either geodetically or treat data as if it is on a plane
- .SUB is a report file that is used in quality control and the inspection process to insure that the proper procedures were used in APROP to subdivide the township

DXFLSA This program creates a drawing file which can be read by many graphic packages. This drawing can then be viewed, edited, plotted, and printed. DXFLSA displays the township lines, the subdivision lines, record bearing/dist. annotation, error ellipses, control points, and polygons. The surveyor can see the results of his work graphically.

T05SR69W.PGC

```
t05sr69w           7                        colo
 ORIGIN     393636.6773 1050633.9565 5000.000    0      0   2000.0000 5000.0000
 100100     393400.3474 1050956.3532 5000.000    0      0   1759.7817 4760.3557
 100200     393452.5171 1050955.8773 5000.000    0      0   1760.3964 4840.3532
  00300     393544.6878 1050955.7385 5000.000    0      0   1760.6110 4920.3527
  00400     393636.8585 1050955.6629 5000.000    0      0   1760.7506 5000.3525
 100500     393729.0285 1050955.3556 5000.000    0      0   1761.1649 5080.3513
 100600     393821.1975 1050954.8384 5000.000    0      0   1761.8278 5160.3484
 100700     393913.3656 1050955.4598 5000.000    0      0   1761.1409 5240.3453
 200100     393400.3474 1050848.9493 5000.000    0      0   1839.7813 4760.3140
 200200     393452.5180 1050848.6274 5000.000    0      0   1840.1966 4840.3131
 200300     393544.6890 1050848.6770 5000.000    0      0   1840.1710 4920.3132
 200400     393636.8599 1050848.7225 5000.000    0      0   1840.1504 5000.3134
 200500     393729.0292 1050849.2361 5000.000    0      0   1839.5747 5080.3115
 200600     393821.1996 1050849.4720 5000.000    0      0   1839.3284 5160.3113
 200640     393847.2839 1050849.1741 5000.000    0      0   1839.6984 5200.3097
 200660     393900.3264 1050849.0995 5000.000    0      0   1839.7952 5220.3095
 200700     393913.2385 1050849.0263 5000.000    0      0   1839.8901 5240.1094
 300100     393400.3474 1050741.5456 5000.000    0      0   1919.7807 4760.2889
 300200     393452.5180 1050741.3691 5000.000    0      0   1920.0068 4840.2882
 300300     393544.6883 1050741.0762 5000.000    0      0   1920.3709 4920.2870
 300400     393636.8587 1050741.2761 5000.000    0      0   1920.1504 5000.2865
 300500     393729.0286 1050741.6072 5000.000    0      0   1919.7744 5080.2855
 300600     393821.1992 1050741.5928 5000.000    0      0   1919.8082 5160.2854
 300640     393847.2844 1050741.5559 5000.000    0      0   1919.8604 5200.2854
 300660     393900.3270 1050741.5466 5000.000    0      0   1919.8755 5220.2854
 300700     393913.2066 1050741.5377 5000.000    0      0   1919.8903 5240.0354
 400100     393400.1653 1050634.1431 5000.000    0      0   1999.7786 4760.0013
 400200     393452.3356 1050633.7489 5000.000    0      0   2000.2464 4840.0002
  00300     393544.5064 1050633.9813 5000.000    0      0   1999.9706 4919.9999
  00400     393636.6773 1050633.9565 5000.000    0      0   2000.0000 5000.0000
 400500     393728.8480 1050634.0632 5000.000    0      0   1999.8736 5080.0000
 400600     393821.0185 1050634.1863 5000.000    0      0   1999.7275 5159.9999
 400640     393847.1036 1050634.0947 5000.000    0      0   1999.8362 5199.9998
 400660     393900.1462 1050634.0718 5000.000    0      0   1999.8633 5219.9998
 400700     393913.1887 1050634.0489 5000.000    0      0   1999.8905 5239.9997
 500100     393400.0896 1050527.0100 5000.000    0      0   2079.4568 4759.8935
 500140     393426.1662 1050526.6281 5000.000    0      0   2079.9019 4799.8799
 500200     393452.2428 1050526.2461 5000.000    0      0   2080.3468 4839.8663
 500300     393544.4138 1050526.3805 5000.000    0      0   2080.1705 4919.8663
 500400     393636.5846 1050526.5524 5000.000    0      0   2079.9500 4999.8662
 500500     393728.7553 1050526.5020 5000.000    0      0   2079.9931 5079.8663
 500600     393820.9257 1050526.7123 5000.000    0      0   2079.7270 5159.8660
 500640     393847.0108 1050526.6109 5000.000    0      0   2079.8389 5199.8658
 500660     393900.0534 1050526.5856 5000.000    0      0   2079.8648 5219.8658
 500700     393913.1286 1050526.5601 5000.000    0      0   2079.8908 5239.9158
 600100     393400.0290 1050419.3939 5000.000    0      0   2159.7085 4759.8255
 600140     393426.1358 1050419.3544 5000.000    0      0   2159.7387 4799.8581
 600200     393452.2425 1050419.3148 5000.000    0      0   2159.7690 4839.8907
 600300     393544.4136 1050419.2264 5000.000    0      0   2159.8406 4919.8908
 600400     393636.5843 1050419.0302 5000.000    0      0   2160.0401 4999.8908
 600500     393728.7549 1050418.8732 5000.000    0      0   2160.1928 5079.8907
 600600     393820.9254 1050418.7324 5000.000    0      0   2160.3264 5159.8907
 600640     393847.0101 1050418.9582 5000.000    0      0   2160.0419 5199.8898
 600660     393900.0526 1050419.0147 5000.000    0      0   2159.9666 5219.8897
  00700     393913.0952 1050419.0711 5000.000    0      0   2159.8913 5239.8895
  00100     393359.9986 1050311.9739 5000.000    0      0   2239.7273 4759.8205
 700140     393426.1480 1050311.6791 5000.000    0      0   2240.0522 4799.9186
 700200     393452.3038 1050311.3743 5000.000    0      0   2240.3888 4840.0266
 700300     393544.4746 1050311.4570 5000.000    0      0   2240.2405 4920.0263
```

T05S R69W. UTM

```
t05sr69w            7                     colo
 ORIGIN     393636.6773 1050633.9565  5000.00   0    0  490605.744384289.84
 100100     393400.3474 1050956.3532  5000.00   0    0  485770.524379477.91
 100200     393452.5171 1050955.8773  5000.00   0    0  485784.844381086.16
   0300     393544.6878 1050955.7385  5000.00   0    0  485791.114382694.47
   0400     393636.8585 1050955.6629  5000.00   0    0  485795.874384302.78
 100500     393729.0285 1050955.3556  5000.00   0    0  485806.164385911.07
 100600     393821.1975 1050954.8384  5000.00   0    0  485821.454387519.31
 100700     393913.3656 1050955.4598  5000.00   0    0  485809.604389127.59
 200100     393400.3474 1050848.9493  5000.00   0    0  487378.844379475.11
 200200     393452.5180 1050848.6274  5000.00   0    0  487389.144381083.40
 200300     393544.6890 1050848.6770  5000.00   0    0  487390.594382691.73
 200400     393636.8599 1050848.7225  5000.00   0    0  487392.134384300.05
 200500     393729.0292 1050849.2361  5000.00   0    0  487382.514385908.35
 200600     393821.1996 1050849.4720  5000.00   0    0  487379.524387516.67
 200640     393847.2839 1050849.1741  5000.00   0    0  487387.944388320.79
 200660     393900.3264 1050849.0995  5000.00   0    0  487390.384388722.86
 200700     393913.2385 1050849.0263  5000.00   0    0  487392.774389120.92
 300100     393400.3474 1050741.5456  5000.00   0    0  488987.144379472.65
 300200     393452.5180 1050741.3691  5000.00   0    0  488993.654381080.95
 300300     393544.6883 1050741.0762  5000.00   0    0  489002.934382689.24
 300400     393636.8587 1050741.2761  5000.00   0    0  489000.454384297.55
 300500     393729.0286 1050741.6072  5000.00   0    0  488994.854385905.86
 300600     393821.1992 1050741.5928  5000.00   0    0  488997.494387514.18
 300640     393847.2844 1050741.5559  5000.00   0    0  488999.524388318.34
 300660     393900.3270 1050741.5466  5000.00   0    0  489000.314388720.42
 300700     393913.2066 1050741.5377  5000.00   0    0  489001.094389117.47
 400100     393400.1653 1050634.1431  5000.00   0    0  490595.424379464.91
 400200     393452.3356 1050633.7489  5000.00   0    0  490606.784381073.20
  00300     393544.5064 1050633.9813  5000.00   0    0  490603.194382681.52
   0400     393636.6773 1050633.9565  5000.00   0    0  490605.744384289.84
 400500     393728.8480 1050634.0632  5000.00   0    0  490605.164385898.16
 400600     393821.0185 1050634.1863  5000.00   0    0  490604.184387506.48
 400640     393847.1036 1050634.0947  5000.00   0    0  490607.354388310.63
 400660     393900.1462 1050634.0718  5000.00   0    0  490608.384388712.71
 400700     393913.1887 1050634.0489  5000.00   0    0  490609.424389114.79
 500100     393400.0896 1050527.0100  5000.00   0    0  492197.274379460.80
 500140     393426.1662 1050526.6281  5000.00   0    0  492207.194380264.67
 500200     393452.2428 1050526.2461  5000.00   0    0  492217.114381068.55
 500300     393544.4138 1050526.3805  5000.00   0    0  492215.534382676.87
 500400     393636.5846 1050526.5524  5000.00   0    0  492213.054384285.19
 500500     393728.7553 1050526.5020  5000.00   0    0  492215.884385893.51
 500600     393820.9257 1050526.7123  5000.00   0    0  492212.494387501.83
 500640     393847.0108 1050526.6109  5000.00   0    0  492215.724388305.98
 500660     393900.0534 1050526.5856  5000.00   0    0  492216.734388708.06
 500700     393913.1286 1050526.5601  5000.00   0    0  492217.744389111.14
 600100     393400.0290 1050419.3939  5000.00   0    0  493810.644379457.47
 600140     393426.1358 1050419.3544  5000.00   0    0  493812.234380262.28
 600200     393452.2425 1050419.3148  5000.00   0    0  493813.824381067.09
 600300     393544.4136 1050419.2264  5000.00   0    0  493817.224382675.41
 600400     393636.5843 1050419.0302  5000.00   0    0  493823.184384283.72
 600500     393728.7549 1050418.8732  5000.00   0    0  493828.214385892.04
 600600     393820.9254 1050418.7324  5000.00   0    0  493832.864387500.35
 600640     393847.0101 1050418.9582  5000.00   0    0  493828.124388304.50
 600660     393900.0526 1050419.0147  5000.00   0    0  493827.094388706.58
   0700     393913.0952 1050419.0711  5000.00   0    0  493826.074389108.66
   0100     393359.9986 1050311.9739  5000.00   0    0  495419.344379455.41
 700140     393426.1480 1050311.6791  5000.00   0    0  495426.854380261.53
 700200     393452.3038 1050311.3743  5000.00   0    0  495434.604381067.85
 700300     393544.4746 1050311.4570  5000.00   0    0  495433.584382676.17
```

ERROR ESTIMATES IN FT. FOR CONTROL

	MIN	MAX
1st Order Control (USGS, NGS)	1	3
2nd Order Control (USGS, other)	3	10
3rd Order Control (USGS,BLM,Other)	5	15
Field Ties to Control	9	20
Photo Control (USGS, other)	10	20
Digitized (USGS 7-1/2' Quads)	23	36
Digitized (USGS 15' Quads)	33	80
Calculated	88	88

1st ORDER 1 ⬢ = 1'

2nd ORDER 2 ▲ = 3'

3rd ORDER 3 ▼ = 8'

SURVEY TIE 4 ◆ = 10'

USGS PHOTO ID 5 ■ = 15'

DIGITIZED 7.5' 6 ● = 23'

DIGITIZED 15' 7 ⬬ = 33'

CALCULATED 8 ▬ = 88'

/ phw
12/7/94

SEC

T26N R25E
GILA AND SALT RIVER MERIDIAN

TASK 5

COMPLEXITY 2
LOTTING

STATE BDY
MINERALS
METES-AND-BOUNDS
HOMESTEAD
TOTAL

RECTANGULAR SURVEY INDEX

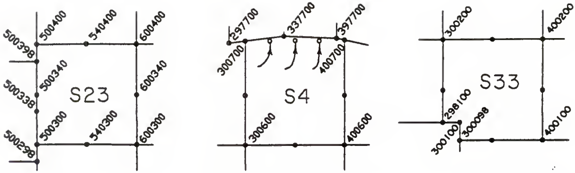
SID	RELI	BDY	VOLUME	INTRODUCTION FROM	TO	SURVEY FROM	TO	CERTIFICATE FROM	TO	STYP	CTRC/ GRP	ISSUED/ APPROVED	SURVEY YEAR	APPROVED	SURVEYOR
5739	3A		R1957	0001	0003	0023	0027	0036	0041	0	0000	13-NOV-84	1885	07-MAR-85	NAVAJO
5556	3A	NORTH	R1874	0001	0005	0019	0019	0023	0025	0	0106	16-APR-03	1904	12-JUL-06	DAY
7960	2B	NORTH	R2959	0001	0001C	0047	0048	0067	0069	0	0000	01-JUN-14	1915	20-JUN-17	MILLER
7961	2B	NORTH	R2959	0001	0001C	0024	0026	0067	0069	R	0000	01-JUN-14	1915	20-JUN-17	MILLER
✓ 7960	2B	NORTH	R2959	0001	0001C	0053	0057	0067	0069	0	0000	01-JUN-14	1915	20-JUN-17	MILLER
7960	2B	SOUTH	R2959	0001	0001C	0038	0039	0067	0069	0	0000	01-JUN-14	1915	20-JUN-17	MILLER
7960	2B	SOUTH	R2959	0001	0001C	0010	0010	0067	0069	0	0000	01-JUN-14	1915	20-JUN-17	MILLER
✓ 7960	2B	SOUTH	R2959	0001	0001C	0049	0052	0067	0069	0	0000	01-JUN-14	1915	20-JUN-17	MILLER
5556	3A	EAST	R1874	0001	0005	0019	0019	0023	0025	0	0106	16-APR-03	1904	12-JUL-06	DAY
✓ 7960	2B	EAST	R2959	0001	0001C	0010	0010	0067	0069	0	0000	01-JUN-14	1915	20-JUN-17	MILLER
✓ 7960	2B	EAST	R2959	0001	0001C	0020	0026	0067	0069	0	0000	01-JUN-14	1915	20-JUN-17	MILLER
✓ 7960	2B	WEST	R2959	0001	0001C	0038	0048	0067	0069	0	0000	01-JUN-14	1915	20-JUN-17	MILLER
7959	3A	SUBD	R2959	0000	0000	0000	0000	0068	0069	0	0000	01-JUN-14	0000	01-JAN-01	MILLER
5738	3A	SUBD	R1957	0001	0003	0023	0027	0036	0041	0	0000	13-NOV-84	1885	07-MAR-85	EVANS
✓ 7962	2B	SUBD	R2960	0001	0001C	0170	0181	0181	0184	0	0000	01-JUN-14	1915	20-JUN-17	MEANDERS
796[illegible]	2B	SUBD	R2960	0001	0001C	0001C	0169	0181	0184	0	0000	01-JUN-14	1915	20-JUN-17	MILLER

MINERAL

SID	VOLUME	ID NUMBER SURVEY	MONUMNT	SURVEY PGS FROM	TO	DISTRICT	LODENAME	STYP	SURVEY YEAR	APPROVED	SURVE

MISCELLANEOUS

SID	VOLUME	ID NUMBER SURVEY	OTHER	SURVEY PGS FROM	TO	SURVACRES	STYP	SURVEY YEAR	APPRVD	SURVEYOR

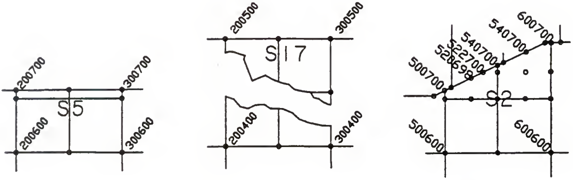


Normal IDs serve as full section corners

Proportioned points need offset to line

Triple section corners

Figure 7-1

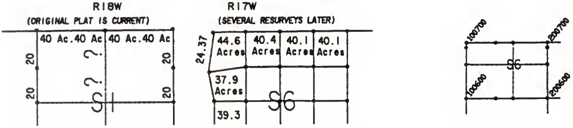


Foreshortened, No N 1/16ths

C 1/4 is non-computable

540700 - Intersect by extension thru 540640

Figure 7-2



Old plat w/ 40 Ac. ... Adjacent new plat

Centerlines not at midpoint

Figure 7-3

05/25/94)

STANDARD OPERATING PROCEDURE
FOR DATA COLLECTION
GCDB SECTION, ARIZONA S.O.

The following discussion is for guidance in the use of GMM data collection software presently in use by the Arizona State Office, GCDB Section. It is separated into four(4) main topics and will be presented in narrative form by topic. Preliminary information for each township in the state is located in "Township Folders", filed by Township, Range, and in Arizona, by GCDB Tasks 0-7.

NOTES: Each file referred to in this discussion is preceded by
Township and Range (eg. T22SR19E.XXX).
Each Task is divided into specific blocks and each block
is computed in its entirety before another block is begun.

ABSTRACTION OF SURVEY DATA

The abstraction of survey data is initiated by obtaining the Survey Record File (.REC), the Survey Control File (.CON), the Township Definition File (.DEF), and the Survey Identification File (.SID) from the PRIME computer. At the present time, this is accomplished by logging onto the PRIME system and creating a township directory for each township (AZ START). These files are then downloaded to a PC where a three digit "Block" subdirectory (first digit indicates Task, second and third digits indicate block within each task, ie. 425=Task 4, Block 25) has been established and where the actual data abstraction and computations take place. Original copies of the .CON and .REC files are reproduced on a PC printer (using 17 CPI for the .REC file). A program called PROJEC is then run on the PC which uses the .DEF file to initiate the township as the current project for GMM and which contains all the normal defaults for the project (state, meridian, coordinate zone, etc.).

The Township Diagram

The first item prepared by the surveyor or survey tech. doing the computation of the township is the Township Diagram. Each separate survey of the boundaries, subdivisional lines, special surveys, and other exceptional situations for each township are researched to obtain the latest correct survey data, using all available sources, private as well as public. **All exceptional situations** (offset boundaries, Mineral surveys, Tracts, etc.) **will be shown in general outline on the Tp diagram**. Any pertinent survey plat(s) and/or survey field notes found to be missing or found to be needed to compute the township, are added to the folder at this time. If the plats show original exterior boundaries with common corners, the adjacent plat(s) need not be inserted into the folder and **"ORIG"** will be written on the Township Diagram next to those boundaries. If the boundaries have been resurveyed or have offset corners, the adjacent plat(s) will be inserted into the Township folder. The .SID and the .REC files are key elements used to research survey data since, in most cases, they contain the most recent and pertinent information on the public records for each township. The surveys are then depicted on the Township Diagram using a color coding system. The SID Number (color coded), Surveyor, and Survey Approval Date are entered on the TP Diagram in the provided spaces and each group (SID Number, Surveyor, Survey Approval Date) is depicted by a single letter on the Tp Diagram, with that same letter on the plat(s) or the top page of the field notes which correspond to that particular survey record. Surveys which are depicted on multiple sheets, using the same SID, would share the same color and be designated by A1, A2, A3, etc. on each sheet. Some older plats will have one letter and two colors if two separate surveys are depicted on that plat. Control stations from the .CON file are plotted (and filled in) on the Tp Diagram, using the symbols shown on the bottom of the diagram.

Complexity

The surveyor/tech. also checks the township complexity levels as shown in the .REC files and, for complexity levels 5 and 6, determines the true complexity level. Any number less than 26 for special surveys contained within a standard township is complexity 4 or lower (as shown on page 54, GCDB Contract Requirements) and is fully abstracted. Any township which remains at complexity levels 5 or 6 will be completely abstracted during the Operations and Maintenance phase of GCDB.

SID's

Only SID's used in the adjustments and their error estimates are kept in the .SID file, and all others are deleted. Created "JUNK" SID's and SID's with -TIE are added to the file. The "Final" .SID file is printed out, labeled with .SID and FINAL, and inserted in the township folder.

Control Stations

Control stations specific for each township are located in the .CON file. These include NGS control, tri-stations which have been tied in by ground survey, and GCDB digitized control from USGS quad sheets. The surveyor/tech. must decide which control stations are usable and make sure that the point ID's conform to the proper GCDB township point ID's. Control points found to be digitized out of position, or which are found to be unusable for "very specific reasons", are "commented" out using an asterisk in the first position of the line for that control point in the .CON file. The "very specific reasons" are spelled out at the end of the file preceded by an asterisk in the first position of each line needed for the explanation.

Control points pertaining only to other townships are deleted, as are control points which have identical coordinates to other control points in the file. Copies of the NGS descriptions, the control station recovery sheets and/or the 3X5 control station description cards, or a screen dump from the Az.NAD27 file available on the PC, are added to the township folder.

If a township has no control, control will be imported from an adjacent township through INRAW boundary import using the .GEO file instead of the .RAW file. Co-ordinates from the .GEO file will be added to the .CON file of the township lacking control by using the UPDATE CONTROL feature in INRAW. The imported control will be held "fixed". Only corners along the imported boundary will be used, with the township corners (SE, NE, SW, NW) excluded.

A "Final" .CON file is printed and placed in the Tp folder along with the printed copy of the "Original" .CON file.

Abstraction Procedure

The abstraction in a township is usually begun with the exterior boundaries and if a boundary or boundaries need computation, **the final results are shown on the plat using a legible and complete sketch diagram(s) for each boundary computation. Copies of this/these diagram(s) are inserted in all appropriate Tp folders.** The GMM software program INRAW allows for the importing of completed boundaries of adjacent townships into the .RAW file (and co-ordinates from the .GEO file into the .CON file if necessary). If the imported boundary doesn't match with the computed boundary, a "Boundary Discrepancy Form" is initiated and the originator of the completed boundary on the adjacent township is consulted in order to resolve the discrepancy. If the two surveyors/techs. cannot resolve the problem, it is referred to a project inspector for resolution. The form is signed, dated, and inserted into the township folder by the surveyor/tech. making the final corrections.

Calculate the centerline parentheticals using acreage by lot and the distances on the section lines on the following sections: those which are lotted on two sides (usually secs. 1, 6, 31, and 36), and those lotted along boundaries containing angle points greater than one degree. These parentheticals are shown on the plat and checked against the AUTO.IRR file created in APROP.

DATA ENTRY

INRAW

The data entry portion of the computation is accessed by using INRAW. This process creates the .RAW data file consisting of GCDB point identifiers, distances, bearings, and SID nos., in that order, and usually begins at the sw cor of the township (the GCDB 100100 corner position). The GCDB point identification scheme is shown in the GMM User Manual. The surveyed and/or protracted boundaries and the surveyed and/or protracted subdivisional lines for the township are usually entered beginning with the N-S lines running from the south boundary to the north boundary, proceeding from west to east and then the E-W lines running from the east boundary to the west boundary, proceeding from south to north. After the normal section exteriors, the order of data entry is; sectional subdivision, in normal rectangular format one section at a time, special survey lines, and offline ties.

INRAW consists of several options which allow the surveyor/tech. computing the township to be very flexible in the task of entering abstracted survey data. Depending upon the specific survey, the bearings and distances are usually abstracted from the plat(s) and/or protraction diagram(s). They may, however, be obtained from field notes if there is no plat for that specific survey. If bearings are not shown on the plat(s) and are not present in the field notes(usually in pre-1900 surveys), then they are usually inferred to be cardinal. A note is placed on the plat(s) stating "Bearings are not in Field Notes".

Another menu choice of INRAW allows for the addition of abstracted "Special Survey Data." The GCDB point identifying scheme is shown in the GMM User Manual and allows for different types of "Special Surveys" which in turn allows the unique identifier to be readily found within the .RAW file. Any surveyed ties from the "Special Surveys" to regular rectangular corners are added to the .RAW file using the proper point identifier, bearing, distance, and the pertinent SID with a "-TIE" added on. This allows the program to compute the tie, but it doesn't show up in the graphical representation of the township.

INRAW also reads control co-ordinates and error estimates from the .CON file and the SID numbers and error estimates from the .SID file. While exiting INRAW, the .LSA data file (distances, bearings, and control coordinates) and the .SD data file (error estimates derived from .SID and .CON files) are created.

RAW

At this time, it is usual for the surveyor/tech. to run a program called RAW. This program uses the temporary coordinates in the .LSA file and creates a raw corner position file called RAW.LSA. This allows the surveyor/tech. to use the program VIEW to visually check his/her input RAW data for keying errors, errors in bearing or distance, for control stations out of position or misnamed, and to check the general outline of the township to see if it looks, in general, the way it is supposed to.

TOWNSHIP CALCULATIONS

GEN

After initial data entry, the surveyor/tech. runs a program called GEN which generates a report of closures for use in detecting blunders in data entry. GEN also updates the .LSA file with approximate corner coordinates derived by compass rule adjustment.

LSMIN

LSMIN is run immediately after GEN. This program reports the least squares adjustment of the abstracted survey data based on one control station chosen by the software. A file named .MIN is created and can be accessed by a text editor and scanned for asterisks (surveyed/protracted lines which greatly exceed error estimates) and Standard error of Unit Weight. This gives the surveyor/tech. an indication as to where there are problems with his/her error estimates on surveys of the township and to detect blunders in data entry.

LSAQ (LS386)

The program LSAQ (LS386 or other variant) is then run to do a Least Squares Adjustment utilizing all control data. Several new files are created: the .ADJ file (report of least squares using all control), the .COR file (report of adjusted coordinates, State Plane), the .GEO file (report of adjusted coordinates, lat./long.), the .PGC file (report of adjusted coordinates in PGCF format) as well as updating the .LSA file by replacing the GEN computed (approximate) coordinates with the least squares adjusted coordinates.

The .ADJ File

The surveyor/tech. next accesses the .ADJ file with a text editor and scans it for control stations missing or not used in the least squares adjustment, for asterisks (surveyed/protracted lines which greatly exceed error estimates), and to ensure the township passes the 5% chi test. If the township fails, he/she re-runs INRAW which allows him/her to adjust the error estimates in the .SID file. The error estimates in the .SID file may be narrowed or widened in order to eliminate the asterisks and/or "Junk" SID's may be created with large error estimates to get the township to pass. He/she then re-runs GEN and LSAQ (or LS386 variant), again accesses the .ADJ file and makes another scan. The surveyor/tech. may choose to run a program called SNOOP.EXE, which will look at the error estimates provided by the SID's and, using statistical analysis, determine locations where correct error estimates for the SID's should be used. This program can be used to fine tune a particular township. When the township passes, he/she goes to the next step of computing the subdivision of sections.

APROP

APROP (or AP) subdivides most sections automatically and provides tools to let the user specify how to subdivide irregular sections. This program allows for the subdivision of each section by naming the section to be subdivided and then proceeding to designate the section corners which are non-computable, non-existent, need to be renamed with a substitute point ID, etc. Each section can be subdivided into aliquot parts as far down as the need dictates. Various types of intersections and closing corners can be computed here and further calculations which are not normal to a section are also added here. **All township/section subdivision computations are done in accordance with the Manual of Surveying Instructions, 1973.** After the completion of the subdivisional calculations, APROP is then executed so that the methods of subdividing the irregular sections can be incorporated into the computations of the "Final" corner positions. The execution of APROP creates the following files: the .ADD file (if there was additional and unusual, defined COGO type computations), the .IRR file (non-standard subdivisions), the .NOT file (for lines not to be computed in subdivision), the .LXN file (an abbreviated LX file), and the .SUB file (a detailed report on all user defined procedures used to subdivide the township and a report on parentheticals). APROP also updates the .COR, .GEO, and .PGC files. Another program called AUTOI may be run to compute rectangular intersections with special survey lines. The execution of AUTOI creates the .INT file which contains the intersection point ID's, methods of computation, and polygon identifications. The .INT file is not accessed more than once and must be recreated using AUTOI if the township is processed through APROP again.

VIEW

The township is then viewed using one of three programs; View for normal townships, and AutoSketch/AutoCad for townships which have been subdivided using AUTOI (and AP).

FORMQC

After all of the computations have been completed and after the boundaries are reconciled, the Block.HW file is created, using each township, with a text editor containing all the completed townships within the Block. FORMQC is then run to ensure that all of the boundaries are identical with those of the adjacent townships.

Completed Townships

After the surveyor/tech. has ensured that the township is complete, hardcopy print-outs, labeled **"FINAL"**, of the .RAW file, the .CON file, and the .SID file are inserted into the township folder. The required data files are copied to a floppy disk and stored in a central location. An initialed and dated blue sticker is placed beside the Twp/Range written on the folder, and the folder is returned to its file cabinet. The date on the sticker becomes the date of final submission (shown on a monthly report) and cannot be altered.

Any additional work performed on a township (e.g. if township is rejected and needs additional work and/or work is performed prior to final submission) will be reflected on a monthly report with 01/01/01 as the date of submission.

Final copies of the .RAW, .CON, .SID, .IRR, .ADD, .INT, as well as the original .REC and .DEF files **MUST** be uploaded to the PRIME (the file server when operational) as a back-up to the floppy disk.

The recommended order of township data which must appear in the township folders is as follows: Boundary Dispute Form (if needed), Quality Control Checklist, the Township Diagram, the required printouts as shown on the QC checklist, the lettered plats and notes, other assorted informational plats and notes, and the MTP.

QUALITY CONTROL/QUALITY ASSURANCE

QC Checklist

The Quality Control checklist should ensure that each township is computed in the most complete, competent, and timely manner. It is the responsibility of the surveyor/tech. doing the abstractions, data entry, and data computations to thoroughly examine each stage of his/her work as it is completed according to this S.O.P. and the QC checklist. As each item on the QC checklist is completed, an X is placed in the space provided. If a particular item does not need computation or is not necessary to complete the township, 0 is placed in the space provided. The QC checklist was made with the normal township in mind, with few if any special surveys or exceptional situations included. Townships with extensive special surveys and/or exceedingly exceptional situations will be encountered which may necessitate deviation from following the QC checklist or even additions to the QC checklist. These townships will be handled on a case by case basis.

All spaces on the checklist will have either an X or 0 in them to indicate that each item was considered in the computation of the township. **The QC checklist is not merely an extra piece of paper to be inserted into the township folder, it is to be used to ensure that each township is computed correctly and accurately.**

QA Checklist

The Quality Assurance checklist tracks the QC checklist and ensures that each item on the QC checklist was considered and done correctly. Any item found to be incorrectly done, or checked off but not actually done is grounds for automatic rejection of the township. The inspector fills out a QA checklist for each township and it contains a space for the acceptance date and a space for the rejection date. There is also space provided to explain why the township was rejected and to make suggestions for corrections. After a township is rejected and returned to the surveyor/tech., it is deducted from his/her total of completed townships currently working on, then before he/she begins a new township, he/she must make the corrections as indicated on the rejection form and then proceed to **check the remaining items on the QC checklist again** to ensure acceptance of the township. After this is done, the township is restored to his/her total of completed townships. If a particular township is rejected three consecutive times, the surveyors/techs. total of completed townships is decreased by one township.

This S.O.P. is subject to revision and/or addition of more procedures as they become necessary.

Surveyors And GIS: Bridging The Gap

The difficulties some surveyors may have with GIS could be the result of how and why GIS originated and what the basics of the technology are.

By Mary Tsui and Lyna Wiggins

GIS is a technology that seems ideally suited to surveying. It combines automated mapping with geo-referenced databases to provide precise, intelligent maps. Improvements in technology and data sources, from digitizers and plotters to GPS receivers and digital orthophotographs, would seem to enhance the surveyor's work. Yet surveying has tip-toed up to GIS, looked gingerly through the knothole at the game, and gazed somewhat askance at the players.

The origins of GIS may provide clues. While many disciplines and experts developed portions of the technology, it seems to first have been designed to aid in the analysis of natural resources. It was improved upon by others in professions that would probably be characterized as "non-precise" by surveyors. Landscape architects, environmental planners, natural resource managers and foresters were early adopters of the technology. This origin is still evident in many of the state GIS systems, with over half of the state efforts located primarily in environmental or natural resource agencies. Statewide base maps for these large areas are typically at small scales (most often 1:24,000).

Early on, urban planners began making wide use of the improving systems and soon had assessors interested in representing parcels via this electronic medium. Because of the system's obvious utility, and in response to the rather large costs of building them, laws were soon proposed to set standards for data collection and for permit application submission; these proposals were often tied to funding schemes.

At this point, surveyors in many areas cried, "Whoaa!!" In some states, surveyors sought to preserve map accuracy and integrity by proposing legislation that would position licensed surveyors or civil engineers as the sole operators of GIS systems. Needless to say, these suggestions were not looked upon favorably by everyone in the growing GIS community.

Surveyors were and are rightly concerned with accuracy. For reasons tied to their respective professions, planners and surveyors see the world quite differently. Surveyors are legally responsible to create highly accurate renditions of property. Planners are responsible for seeing property in context: the context of surrounding parcels, water, traffic, soils and land use. This has always been true, and caused little problem until the two disciplines converged on the issue of electronically generated maps.

"Surveyors are in a position to begin setting the pace and tone of GIS adoption and implementation."

Even this would have been of little consequence, were it not for the issue of money. Since digital data was very expensive to acquire, planners could live with relatively squishy data, give or take 50 feet. Who cares when you're looking at land use? Surveyors, of course, could under no circumstances live with such imprecision. When it became clear that this technology was the wave of the future, surveyors understandably wanted to ensure that the products were accurate. Unfortunately, accurate maps were in many cases more expensive than most agencies could afford. Everyone believed they would be prevented from having an automated system if costs remained high. Stories of "failed" implementations abounded at GIS professional conferences; they pointed to the many years and dollars required to complete "extremely" accurate base maps, while policy analysts and elected officials waited—increasingly less patiently—for applications and products. The result was a growing level of antagonism on the subject of GIS between surveyors and almost everyone else.

Some surveyors have become suspicious not only of GIS users but of GIS itself. We can only hope that this is beginning to change. Due to improved technology and software, prices for accurate data are falling. The related technology and software are enormously improved and reduced in cost. These trends are increasing our ability to deal with data of varying accuracy and scale. It is possible for the diverse professions to again find common ground in maps. Recent surveys indicate that the large majority of municipalities are implementing GIS or plan to adopt it.

Surveyors are in a better position than ever to drive the conversion of maps from hand-drafting to digital form and to guarantee continued electronic maintenance. It appears to us that surveyors do not currently perceive themselves as being in the driver's seat, perhaps because of events in

Continued on page 24

Bridging The GIS Gap

Continued from page 21

the past. However, because the surveying profession is quickly adopting the use of the most logical tools, their use may soon outpace the public sector's ability to keep up. It is now economically feasible —desirable even—for surveyors to use the most sophisticated data collection processes (field GPS units, for example) and to produce digital maps rather than to rely on more traditional methods; as surveyors walk into local government agencies with disk in hand, it won't be long before the agencies have to respond.

In addition, a changing focus on new techniques is taking place in college and university surveying programs across the country, a change that is attracting students with strong interests in new technologies. By proper use of dual-precision software and sophisticated data collection systems, surveyors are now submitting superior maps and can more readily defend their work against the questions and opinions of public agencies. In fact, surveyors are in a position to begin setting the pace and tone of GIS adoption and implementation.

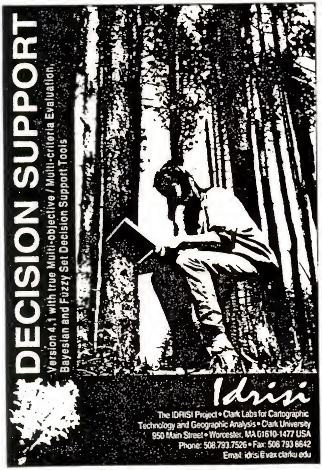
It is a good idea for surveyors to attend workshops to learn a bit about GIS and about the other professions that are making use of the technology. Workshops and for-credit courses are available from professional associations, universities and the vendor community. We suggest that surveyors first take a course or workshop offering basic GIS concepts, then move on to more advanced or software-specific courses. We teach such a workshop, Introduction to GIS, on behalf of the Urban and Regional Information Systems Association (URISA), a cross-disciplinary association that early on championed the use and development of GIS technology. During these workshops, we present the basics of GIS to a rather astonishing cross section of professionals who use geographic data; increasingly, many of these participants are surveyors. In addition to learning about the technology, participants learn a great deal about the work and data needs of others, and are frequently surprised to find they have more in common than they have differences.

The common issues across disciplines are deciding what one wishes to do, who is going to use the GIS, what database structure to use, what software features are needed, organizational issues to anticipate, where to get data, how to keep it current and trends for the future. In addition to these cross cutting issues, the workshop covers basic concepts of GIS. Here we briefly introduce several core concepts. Spatial data are represented in three basic ways: points, lines and polygons.

•Points are sometimes referred to as "incidents." "Pin maps" are representations of incidents, whether they be crimes, stop signs, archaeological sites, man-hole covers or telephone poles.

•Lines are representations of street centerlines, rivers, pipelines, electrical lines, even battle movements.

•Polygons are bounded entities, such as districts, fields, land use types, parcels, countries, counties and police beats. Note that streets can be represented as lines at smaller scales and as polygons (e.g., as



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CIRCLE NUMBER 34

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areas between curb lines) at larger scales.

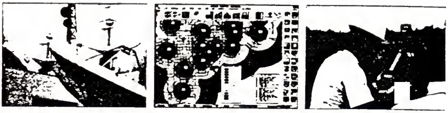
GIS takes these graphical representations and combines them with textual or tabular data that describe them. For example, we may say that a particular polygon is best described as parcel # 123-456-789 or, perhaps, as a country. As long as we tag both the description and the graphic with a unique identifier, they remain linked. Other "non-graphic" or "attribute" data may be linked to the map features from related data tables. For example, records from the assessor's database including information on ownership, assessed values, number of rooms, etc., could be linked to the map. As long as common fields exist in multiple data tables, these tables can be linked using database management systems. In another example, the community development office might have a database for subsidized rental units that also uses the parcel number as a unique identifier. The data table from the assessor and the data table from the planners could be combined in a number of ways, and a resulting "joined" table could then be linked to the map. Therefore, in a GIS one can see the drawn polygon and learn the other details about it—its name, attributes, significance, history, etc.

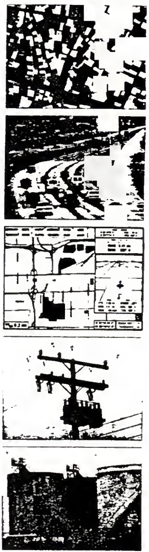
Many data sources for GIS provide us with data represented as a grid (or matrix) of values. Satellite imagery and digital orthophotos, for instance, provide very large grids of data. The resolution of each grid cell determines the resolution of the map. Systems oriented to these data sources are typically called raster systems. On the other hand, those that use points, lines and polygons as their major features are typically called vector systems.

Only a few years ago, professional conferences had many sessions centered around debates about raster-versus-vector systems, and which was "best" for particular applications. Other debates focused on what resolution of raster data was most appropriate for particular cases. Both of these debates are now largely resolved through technological innovations in data collection, data interpretation and classification, and software. Higher resolution digital imagery and improved software for classification are making data conversion increasingly accurate and less expensive. Most upper-end GIS software now allows the use of both raster and vector data, and "vectorization" and "rasterization" techniques allow easier transformations between the two forms.

We feel strongly that basic GIS knowledge will become a professional requirement in most of the disciplines that deal with our use of land and natural resources. A good place to start is by attending workshops, professional meetings and user group functions in your region. We hope to see more surveyors at upcoming URISA workshops or conferences, where an interdisciplinary perspective may help us all find common ground in the future. PS

Mary Tsui is a principal with Land Systems Group in Monterey, California. Lyna Wiggins is associate director of the Center for Urban Policy Research and associate professor in the Bloustein School of Planning and Public Policy at Rutgers University. For information about URISA workshops, call 202/289-1685.





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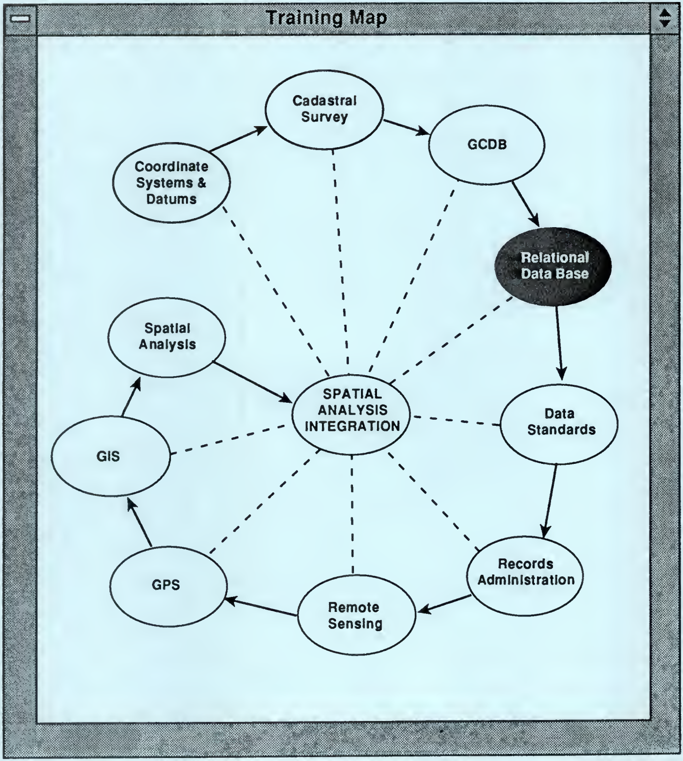
CIRCLE NUMBER 68

GEO - DATA COLLECTION & USE
(for Ecosystem Based Management)



Course No. 1730-11

RELATIONAL DATA BASE MANAGEMENT SYSTEMS

LESSON OBJECTIVE

☞ Given spatially related information, the Trainee will be able to design a relational data base and data dictionary.

☞ Given tabular, data base data, the Trainee will be able to spacially relate subsets of the data.

TERMS

RDBMS:

ENTITY:

ENTITY NAME:

ATTRIBUTE:

PRIMARY KEY:

FOREIGN KEY:

RELATIONSHIPS:

- **ONE-TO-ONE**
- **ONE-TO-MANY**
- **MANY-TO-ONE**
- **MANY-TO-MANY**

DATA DICTIONARY:

Reading the Models

The Standard is expressed as a data model. There is an entity relationship diagram (ERD) that illustrates the entities, their attributes, and their relationships. This section describes how to read and interpret the diagram. The entity relationship diagram is accompanied by an entity-attribute dictionary that defines the terms shown in the diagram.

The data model shown in the Standard is not intended to be an implementation data model. Implementation requires modifying the data model to best fit the operating software. This process is sometimes called *denormalization* and is the process of combining entities into tables in a database that will optimize the database operation.

The Standard data model describes the definitions or semantics of cadastral information. The data models are a shorthand method for showing the relationships among various objects. The data models for the Cadastral Data Content Standard are expressed as entity-relationship diagrams (ERD). Entity-relationship diagrams have several components.

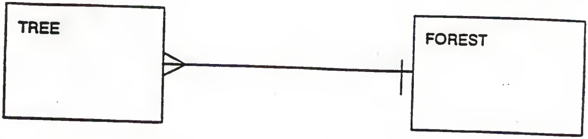
ENTITIES

Entities are objects or individual items. These are shown in boxes. The name of entities are shown in capital letters, as examples, CORNER or LAND UNIT. By convention, entity names are singular, such as corner rather than corners. In Example 1 the entities are TREE and FOREST.

RELATIONSHIPS

Relationships describe how the various objects are related to each other. The relationships in the Cadastral Data Exchange Model are: one to many, many to one, and many to many. An example of a many-to-one relationship is: *a forest is composed of many trees*. This is a relationship between an object *forest* and an object *tree*.

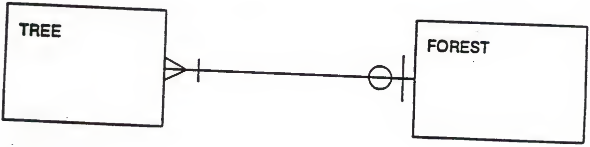
A diagram of the entities forest and tree and their relationship is shown in Example 1:



Example 1 - Entities and Relationships

CARDINALITY

Cardinality means whether the relationship between the two entities is mandatory or optional. For example, a forest must have more than one tree, but a tree may be in forest. Cardinality is the must and may. *The cardinality aspects of the data model are shown as a circle for optional and a line for mandatory.* The relationship between a forest and a tree with the cardinality is shown in Example 2.



Example 2 - Entities, Relationships, and Cardinality

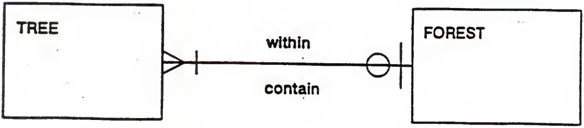
Notice that a line has been added to the many symbol and a circle has been added to the single or one symbol.

RELATIONSHIP DESCRIPTIONS

On each of the lines that connect the entities there are verbs that more fully describe how the entities are related to each other. These are read in a clockwise manner, which means the relationships in Example 3 are read as:

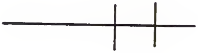
one tree may be within a forest

one forest must contain many trees

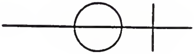


Example 3 - Entities, Relationships, Cardinality, and Descriptions

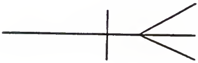
The cardinality and relationship symbols used in the Cadastral Data Content Standard are shown below.



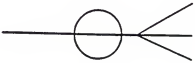
Mandatory Single



Optional Single



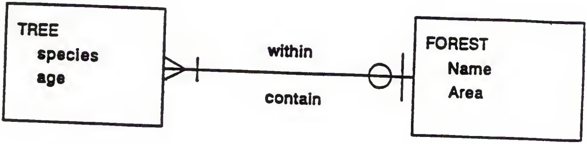
Mandatory Many



Optional Many

ATTRIBUTES

Attributes are the properties and characteristics of entities. These are listed in the box with the entity name and are shown in upper and lower case. In many entities the first attribute has a name that ends with an ID, such as Corner ID. This is an attribute that serves as an identifier for each unique record or entry in the entity and is called a *primary key*. Another kind of attribute is a *foreign key*. A foreign key is a primary key from another entity that points to a record in the related entity. For example, if CORNER ID is a primary key in an entity for Corner, then an entity for Boundary may have a foreign key for a CORNER ID that points to a specific corner record that is the endpoint of the boundary. In this case the CORNER ID attribute in the Boundary entity is a foreign key in the Boundary entity. An example of a completed model with the attributes is shown in Example 4.



Example 4 - Completed ERD for Tree and Forest

INDIAN HILLS SITES (ihsites)

DATA DICTIONARY

(from the New Mexico Cultural Resources Inventory System)

Introduction

The New Mexico Cultural Resource Information System (NMCRIS) is an integrated computer information system designed to support cultural resource management and research in New Mexico. Ultimately, NMCRIS will integrate geographic, management, and research-related data pertaining to three major classes of cultural resources: archeological sites, historic architectural sites, and traditional cultural properties.

For the GeoData class, a very small subset of the whole NMCRIS will be used (four tables out of sixty-nine).

Data Entities and Relationships

Projects

A project is an undertaking that involves the identification, protection or treatment of cultural resources. As it is used in NMCRIS, the term project refers to an overall undertaking (e.g., a pipeline, road construction, a timber sale) involving cultural resource investigations.

Each NMCRIS project is the administrative responsibility of a sponsoring agency. For most projects, the sponsoring agency will be a federal, state, or tribal agency. Research projects my be sponsored by a government agency, an educational institution, or an individual. Although large projects may involve lands owned or administered by many different agencies and private individuals, a project may have one--and only one--sponsoring agency. This agency will be the lead agency for purposes of consultation with the State Historic Preservation Officer under Section 106 of the National Historic Preservation Act.

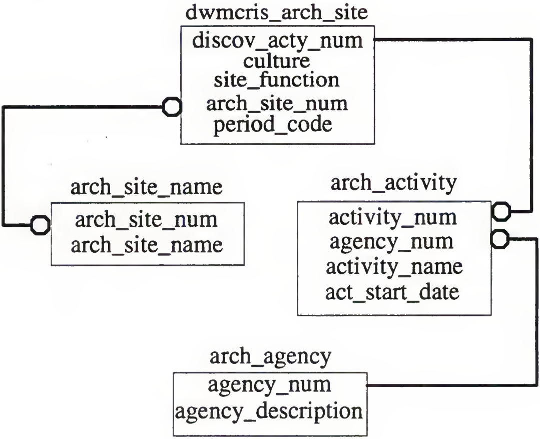
Activities

A project comprises one or more activities. An activity is defined as one or more investigative actions (surveys, excavations, analyses, etc.) conducted and reported by a single performing agency. Activities cannot exist in isolation: an activity can be directly related to one--and only one--project. Activities may be related to other activities through their common association with a single project. An activitiy may investigate one or more sites.

Sites

As physical entities, sites are familiar to all archeologists. But in NMCRIS, sites are defined as complex informational entities, or as site records. A site record is normally seen as a collection of descriptive and interpretive informantion relating to a site's location, size, contents, ownership, occupational history, and so on.

Model



Tables

dwmcris_arch_site (Dan W. Martin's Cultural Resource Inventory System)
Includes:

dicov_acty_num
Description: Discovering Activity Number Serial
Foreign Key: arch_activity.activity_num

culture
Description: Culture Code Character 65
Culture describes the peoples affiliated with or that used/built the site, i.e. Anasasi, Mogollon, Pueblo, etc..

site_function
Description: Site Function Character 65
This field was borrowed from the Colorado data base and refers to the type of activity that occurred at the site such as hunting, burials, rituals, or camp.

arch_site_num
Description: Archeological Site Number Character 15
Primary Key

period_code
Description: Period Code Character 15
A code indicating whether the site is archaic or historic.

arch_site_name Includes:

arch_site num
Description: Archeological SIte Number Character 15
Foreign Key: dwmcris_arch_site.arch_site_num

arch_site_name
Description: Site Name Character 60
Enter names associated with the site. Unnamed sites may be named by project personnel. If there are several known spellings, make an entry for these as well.

arch_activity Includes:

activity_num
Description: Activity Number Integer
Primary Key

agency_num
Description: Performing Agency Integer
Foreign Key: arch_agency.agency_num

activity_name
Description: Activity Name Character 40
If the performing agency has a unique identifying name for the activity, enter it here.

act_start_date
Description: Activity Dates Date
Enter the performing agency's starting date for the activity using the default dd/mm/yyyy format (e.g., 25/12/1994).

arch_agency Includes:

agency_num
Description: Performing Agency Integer
Primary Key

agency_description
Description: Performing Agency Character 40
Enter the agency name and administrative unit performing the activity. If subcontrators are directly involved in the activity, enter that agency.

arch_activity

activity_num	agency_num	act_start_date
1717	6	01/09/1979
1717	6	01/09/1979
1701	7	12/14/1990
1699	31	08/16/1974
1698	31	06/25/1974
1697	31	07/25/1974
1678	6	06/29/1974
1678	6	06/29/1974
1675	5	06/28/1974
1674		01/01/1966
1658	6	01/19/1979
1652	18	11/12/1988
1652	18	11/12/1988
1648	23	06/01/1978
1640	6	01/13/1979
1658	6	01/19/1979
1600	7	03/29/1988
1590	14	04/28/1987
1589		04/01/1987
1585	14	09/15/1986
1585	14	09/15/1986
1585	14	09/15/1986
1585	14	09/15/1986
1538	17	10/01/1975
1536		03/01/1974
1501	7	04/23/1985
1500	29	04/03/1985
1498	7	03/17/1985
1484	5	03/07/1989
1468		07/01/1982
1422	5	04/02/1989
1406	6	11/03/1979
1404	6	05/19/1979
1403	6	05/12/1979
1402	6	06/16/1979
1402	6	06/16/1979
1371	6	03/23/1977
1370	6	04/20/1977
1370	6	04/20/1977
1310	6	03/14/1980
1306	6	05/04/1980
1293	31	01/01/1930

arch_agency

```
agency_num agency_description

        32 Women in Crisis
        31 University of Denver-Anthropology
        30 University of Colorado-Denver
        29 University of Colorado - Boulder
        28 United States Post Office
        27 Shapins/Moss, Inc.
        26 Rebecca Herbst
        25 Powers Elevation Co., Inc.
        24 Pike - San Isabel National Forest
        23 Office of the State Archeologist
        22 Office of Archaeology & Historic Preserv
        21 Native Cultural Services
        20 Morrison Historical Commitee of the Jeff
        19 Long - Hoeft Architects
        18 Kathryn L. Joyner
        17 Jefferson County Historical Society- DO
        16 Hammer, Siler, George Associates
        15 Gordon and Kranzush Archaeological Consu
        14 Goodson & Associates, Inc.
        13 Front Range Research Associates
        12 Division of Minerals & Geology (Mined La
        11 Department of Housing and Urban Developm
        10 Colorado Historical Society
         9 Colorado Division of Wildlife
         8 Colorado Department of Transportation
         7 Colorado Department of Highways
         6 Colorado Archaeological Society - Denver
         5 Colorado Archaeological Society
         4 City of Arvada
         3 Burney & Associates, Inc.
         2 Beland Associates, Inc.
         1 Arapaho Roosevelt National Forest
```

	dwmcris_arch_site				
acty_num	culture	site_function		arch_site_num	period_code
1293	UNKNOWN ABORIGINAL	OPEN	CAMP	5JF.122	Archaeological
1306	UNKNOWN ABORIGINAL	ISOLATED	FIND	5JF.143	Archaeological
1310	MIDDLE ARCHAIC	SHELTERED	CAMP	5JF.148	Archaeological
1717	LATE ARCHAIC	OPEN	CAMP	5JF.149	Archaeological
1717	WOODLAND	OPEN	CAMP	5JF.150	Archaeological
1370	UNKNOWN ABORIGINAL	OPEN	CAMP	5JF.208	Archaeological
1370	UNKNOWN ABORIGINAL	SHELTERED	CAMP	5JF.210	Archaeological
1371	WOODLAND	SHELTERED	CAMP	5JF.211	Archaeological
1402	UNKNOWN ABORIGINAL	ISOLATED	FIND	5JF.241	Archaeological
1402	UNKNOWN	HISTORIC?		5JF.242	Historical
1403	WOODLAND?	OPEN	LITHIC	5JF.243	Archaeological
1404	UNKNOWN ABORIGINAL	OPEN	LITHIC	5JF.244	Archaeological
1406	UNKNOWN ABORIGINAL	SHELTERED	CAMP	5JF.246	Archaeological
1422	CULTURAL AFFIL UNKNOWN	SHELTERED	CAMP	5JF.260	Archaeological
1468				5JF.302	Historic
1484	WOODLAND	OPEN	ARCHITECTURAL	5JF.321	Archaeological
1498	LATE ARCHAIC	KILL	SITE	5JF.339	Archaeological
1500	UNKNOWN ABORIGINAL	OPEN	CAMP	5JF.341	Archaeological
1501	UNKNOWN ABORIGINAL	ISOLATED	FIND	5JF.342	Archaeological
1536				5JF.379	Historic
1538				5JF.380	Historic
1585				5JF.448	Historic
1585	ABORIGINAL	OPEN	CAMP	5JF.449	Archaeological
1585	ABORIGINAL	OPEN	CAMP	5JF.450	Archaeological
1585	ABORIGINAL	ISOLATED	FIND	5JF.451	Archaeological
1589				5JF.452	Historic
1590	ABORIGINAL	OPEN	CAMP	5JF.453	Archaeological
1600	LATE ARCHAIC	OPEN	CAMP	5JF.463	Archaeological
1658	UNKNOWN ABORIGINAL	OPEN	CAMP	5JF.50	Archaeological
1640	ARCHAIC	SHELTERED	CAMP	5JF.51	Archaeological
1648	EARLY ARCHAIC	SHELTERED	CAMP	5JF.52	Archaeological
1652				5JF.523	Historic
1652				5JF.524	Historic
1658	UNKNOWN ABORIGINAL	OPEN	CAMP	5JF.57	Archaeological
1674	ARCHAIC	SHELTERED	CAMP	5JF.6	Archaeological
1675	WOODLAND	OPEN	CAMP	5JF.60	Archaeological
1678	UNKNOWN ABORIGINAL	SHELTERED	CAMP	5JF.61	Archaeological
1678	UNKNOWN ABORIGINAL	SHELTERED	CAMP	5JF.62	Archaeological
1697	UNKNOWN ABORIGINAL	SHELTERED	CAMP	5JF.76	Archaeological
1698	UNKNOWN ABORIGINAL	SHELTERED	CAMP	5JF.77	Archaeological
1699	UNKNOWN ABORIGINAL	SHELTERED	CAMP	5JF.78	Archaeological
1701	HISTORIC	SHELTERED	CAMP	5JF.8	Archaeological

arch_site_name					
arch_site_num	arch_site_name				
5JF.122					
5JF.143					
5JF.148	CRESCENT	ROCKSHELTER			
5JF.149	PINNACLE				
5JF.150	BIG	RED			
5JF.208	HILLTOP				
5JF.210					
5JF.211	FALCONS	NEST			
5JF.241					
5JF.242					
5JF.243					
5JF.244					
5JF.246	DEER	CREEK	SHELTER		
5JF.260	DUTCH	CREEK	SHELTER;	OGAM	CAVE
5JF.302	SANGER	RANCH			
5JF.321	SWALLOW	SITE			
5JF.339	THE	MASSEY	DRAW	SITE	
5JF.341					
5JF.342					
5JF.379	TINY	TOWN			
5JF.380	KEN-CARYL	RANCH			
5JF.448					
5JF.449					
5JF.450					
5JF.451					
5JF.452					
5JF.453					
5JF.463	DUTCH	CREEK	SITE		
5JF.50	BRADFORD	HOUSE	1		
5JF.51	BRADFORD	HOUSE	2		
5JF.52	BRADFORD	HOUSE	III		
5JF.523	Bergen	Ditch			
5JF.524	HINE	LAKE			
5JF.57	MONOLITH-BRADFORD	HOUSE			
5JF.6	WILLOWBROOK				
5JF.60					
5JF.61					
5JF.62					
5JF.76					
5JF.77					
5JF.78					
5JF.8			GRAEBER	CAVE	

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Relational Databases
Exercise -- Queries

Using the Archaeological Database in the notebook, answer the following questions:

1. How many activities are being administered by the Colorado Archaeological Society (both)?

2. Of these, which is the most recent activity?

3. On which site (name and number) is the above activity taking place?

4. Which is the oldest activity?

5. On which site (name and number) is the oldest activity taking place?

6. Which agency performed the above activity?

7. How many Historic sites are there?

8. What are their names?

9. What agencies, respectively, perform the activities at the historic sites?

10. What are the Primary Keys in each of the four tables?

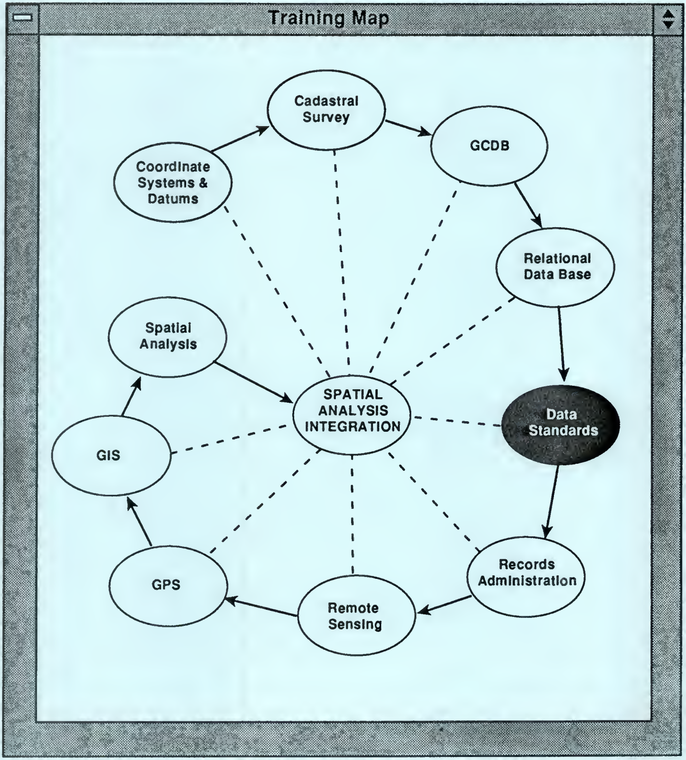
$$\begin{array}{r} \$10^{\underline{00}} \\ \underline{7^{\underline{20}}} \\ 2^{\underline{80}} \end{array}$$

$\$3^{\underline{20}}$

$$\begin{array}{r} \boxed{\$2.49} \\ \underline{1.40} \end{array}$$

$$\begin{array}{r} 4^{\underline{00}} \\ \underline{3^{\underline{20}}} \\ 7^{20} \end{array} \qquad \begin{array}{r} 7^{\underline{20}} \\ \underline{2^{\underline{50}}} \\ 4^{\underline{70}} \end{array}$$

GEO - DATA COLLECTION & USE
(for Ecosystem Based Management)



Course No. 1730-11

DATA STANDARDS

LESSON OBJECTIVE

By becoming familiar with "metadata" and recognizing "data standards" the Trainee will be able to apply the principles of data standards to the relational data base developed for the Geodata training course.

☞ ☜

BLM Library
Denver Federal Center
Bldg. 50, OC-521
P.O. Box 25047
Denver, CO 80225

DATA STANDARDS

BASIC TERMINOLOGY

DATA:

LETTERS, NUMBERS, OR SYMBOLS REPRESENTING FACTS, IDEAS, OR VALUES WHICH MAY BE USED TO PRODUCE INFORMATION.

DATA DICTIONARY:

A REPOSITORY FOR ALL INFORMATION ABOUT DATA; USUALLY DISPLAYED TO PROVIDE INFORMATION BY DATA ELEMENT.

DATA ELEMENT:

A FACT THAT IS A NON-DECOMPOSABLE (SMALLEST UNIT) PIECE OF INFORMATION WHICH DESCRIBES SOMETHING (A PERSON, PLACE, THING, OCCURRENCE).

NOTE: FOR DATA ELEMENTS, IT IS IMPORTANT THAT WE DEFINE BOTH THE SPATIAL AND ALPHANUMERIC OR TEXTUAL PARTS TOGETHER.

DATA STEWARD/STEWARDSHIP:

DATA STEWARDSHIP - *RESPONSIBILITY TO MANAGE DATA WITH PROPER REGARD TO THE INFORMATIONAL NEEDS OF OTHERS AND TO MEET THE BLM'S MISSION.*

DATA STEWARD - *THE MOST KNOWLEDGEABLE PERSON(S) FOR THEIR RESPECTIVE AREA(S) OF EXPERTISE WHO CAN BEST DETERMINE WHEN DATA ACCURATELY REFLECTS THE RESOURCE ITSELF (AUTHENTICITY) AND WHEN IT EITHER ADHERES TO EXISTING STANDARDS OR REQUIRES NEW ONES TO BE DEVELOPED.*

METADATA:

INFORMATION ABOUT DATA OR "DATA ABOUT DATA"; **E.G.:**

- **HEADER INFORMATION ON A PRINTOUT**
- **LOTUS 1-2-3 BUDGET SPREADSHEET "CELL" DESCRIPTION**
- **GIS MAP LEGENDS**
- **GPS "DATA DICTIONARY"**

DATA STANDARDS: (SEE NEXT PAGE)

DATA STANDARDS

WHAT ARE THEY ?

DATA STANDARDS ARE DEFINED AS:

"THE RULES BY WHICH DATA ARE DESCRIBED AND RECORDED".

FOR EXAMPLE, A STANDARD FOR RECORDING MONTHS OF THE YEAR MIGHT BE THAT THE MONTHS MUST BE NUMERIC (EXPRESSED AS A NUMBER), HAVE A FIELD LENGTH OF TWO, AND RANGE FROM 01 TO 12.

HOW WOULD YOU DEFINE AN ENTIRE DATE; I.E., DAY-MONTH-YEAR?

Examples: 12/02/92; DECEMBER 2, 1992; 02-DECEMBER-92

****

> THESE ARE EXAMPLES OF AT LEAST THREE WAYS TO DEFINE DATE.

> EACH IS OK IN ITS OWN RIGHT

> HOWEVER, THE ONLY WAY WE CAN KNOW FOR SURE WHAT DATE FORMAT TO USE IN ORDER TO SHARE OR EXCHANGE THE DATA IS TO "STANDARDIZE" THE FORMAT.

NOTE: THE STANDARD BUREAU FORMAT FOR DATE IS:

MM/DD/YYYY (MONTH-MONTH/DAY-DAY/YEAR-YEAR-YEAR-YEAR

OR

05/09/1994

DATA STANDARDS ADDRESS SUCH THINGS AS:

- *DATA AUTHORS/OWNERS NAMES & HOW TO CONTACT*
- *CONTENT (SUBJECT MATTER)*
- *UNITS OF MEASURE*
- *DATA ENTITIES, ELEMENTS AND CODES*
- *FIELD LENGTH (THE LIMIT ON THE NUMBER OF DATA CHARACTERS)*
- *SOFTWARE*
- *FORMAT CONSIDERATIONS*
- *DEFINITIONS*
- *ALPHANUMERIC/SPATIAL CHARACTERS*
- *QUALITY CONTROL AND QUALITY ASSURANCE*
- *ACCESS RESTRICTIONS/CONTROL/SECURITY*
- *SPATIAL DATA INTERFACE; THEMES/SYMBOLOGY*
- *GPS ACCURACY*

****

DATA STANDARDS ARE DEVELOPED BY THE PERSON(S) MOST KNOWLEDGEABLE ABOUT THE SUBJECT MATTER AND THEIR USE OF/NEED FOR STANDARDS :

DATA STEWARDS

****

* DATA ELEMENT DEFINITION WORK GROUP EXERCISE - REFER TO OVERHEAD AND FLIP CHARTS

DATA STANDARDS

WHY DO YOU USE THEM ?

PARTICIPANTS NOTE: USE THIS PAGE TO RECORD YOUR NOTES, EXAMPLES, COMMENTS, AND ANSWERS FOR THE WORK GROUP EXERCISE

* **CONSISTENCY**

* **LEGAL REQUIREMENTS**

* **COMPILATION OF DATA AND STATISTICS - AT ALL LEVELS**

* **DATA SHARING AND EXCHANGE**

DATA STANDARDS

WHERE DO YOU FIND THEM ?

PARTICIPANTS NOTE: ***TRY AND LIST AT LEAST ONE EXAMPLE FOR EACH DATA STANDARD SOURCE, WHERE IT IS POSSIBLE TO DO SO; THEN, BRING IT UP BEFORE THE CLASS.***

> *PROFESSIONAL PUBLICATIONS*

> *DATA STEWARDS*

> *COUNTERPARTS IN OTHER AGENCIES/*
OTHER AGENCIES STANDARDS
Example: USGS and DLG Standards

> *FEDERAL LAWS AND REGULATIONS*
Example: 43 CFR PART 4000

> *BLM MANUAL SECTIONS/SUPPLEMENTS*
Example: BLM Manual Section 1275 - Land Status Records

> *HANDBOOKS*

> *GUIDES/USER GUIDES*

> *INSTRUCTION MEMO'S &*
INFORMATION BULLETINS
Example: "Planning Aid #7"

> *LIFE CYCLE MANAGEMENT (LCM) DOCUMENTATION*

> *DATA ELEMENT DICTIONARY*

> *THE NEW MODERNIZATION DATA DICTIONARY*

> *SPECIAL EFFORTS; E.G., FGDC*

DATA STANDARDS

HOW DO YOU USE THEM ?

THREE BASIC PLACES IN BUREAU FUNCTIONS THAT DATA STANDARDS WILL BE USED MOST

DATA COLLECTION

Measurements

Facts and Figures

Preciseness

Method

DATA REPORTING

What You Saw Is What You Reported
AND
What You Were Supposed To Report

DATA SHARING/EXCHANGE

Sharing - BLM Data Is Shared With Others

Exchanging - BLM Provides Data To Others **AND**
BLM Gets Their Data In Return

Can Involve Many Agencies, Organizations, Others

Must Address Data Standards, Information Access and Security

DATA STANDARD
ROLES & RESPONSIBILITIES
FOR BLM PERSONNEL WORKING WITH GEO-DATA

STANDARD MEASUREMENTS

Responsible for the standard units of measure and the measurements that are collected.

REPORTING OF DATA

Responsible to see that the correct reporting of data takes effect; e.g., data are processed correctly, are accurate and authentic.

DATA STANDARDS

Responsible to see that the same standards are used across the Bureau so that exchange of data provides the same kind of information to all who need and obtain it.

Responsible to ensure that spatial data and alphanumeric (or textual) data are linked and coordinated, where appropriate.

If a standard is good, ensures that it is used. If a standard is bad, or out-of-date, helps surface this and develops a new standard.

SUMMARY
GEO-DATA COLLECTION & USE

DATA STANDARDS

THE ESTABLISHMENT AND APPLICATION OF DATA STANDARDS DURING GEO-DATA COLLECTION & USE WILL:

> *ENHANCE DATA QUALITY AND PRODUCTION*

> *FACILITATE DATA SHARING AND EXCHANGE*

> *IMPROVE PUBLIC RESPONSE TIME - HIGHER QUALITY PRODUCTS, FASTER*

> *MAINTAIN A PROFESSIONAL IMAGE*

> *IMPROVE USER ACCEPTANCE - BASE DATA AND RESOURCE DATA*

> *HELP ASSURE THE USE OF SPATIAL DATA WITH ITS TEXTUAL OR ALPHANUMERIC COUNTERPART*

> *REDUCE MAINTENANCE*

> *IMPROVE LAND USE PLANNING & ANALYSIS; RMP'S, EIS'S, ACTIVITY PLANS*

> *REDUCE DUPLICATION OF EFFORT AND DATA COLLECTION*

> *MINIMIZE LEGAL PROBLEMS; BETTER AUDIT TRAILS & SOUND PROCEDURE*

1220 Subject Code Management

9150 Buildings and Recreation Facilities
  - 9151 Buildings
  - 9152 Water and Sewage
  - 9153 Heating, Ventilating and Air Conditioning Systems
  - 9154 Electrical Systems
  - 9155 Recreation Facilities
  - 9156-59 Unassigned

9160 Mapping Sciences
  - 9161-63 Cartography
  - 9164 Photogrammetry
  - 9165 Map Reproduction and Printing
  - 9166 Map Storage and Distribution
  - 9167 Geographic Information Systems (GIS)
  - 9168-69 Unassigned

9170 Surface Resource Facilities
  - 9171 Water Development
  - 9172 Water Control Structure
  - 9173 Protection Facilities
  - 9174 Stream and Channel Structures
  - 9175 Land Treatment
  - 9176 Stabilization Procedures
  - 9177 Maintenance and Safety of Dams
  - 9178-79 Unassigned

9180 Cadastral Survey
  - 9181 Air Pollution Control
  - 9182 Wastewater Treatment
  - 9183 Special Surveys
  - 9184 Drinking Water Supply
  - 9185 Instructions and Methods
  - 9186 Noise Abatement
  - 9187 Underground Injection Control
  - 9188 Nonpoint Source Pollution Control
  - 9189 Unassigned

- 9190 Equipment Developement
    - 9191 Planning
    - 9192 Cost and Rate Studies
    - 9193 Technical Spectifications
    - 9194-99 Unassigned
- 9600 Geo-Sciences
    - 9601 Determination of Survey Requirement
    - 9602-3 Unassigned
    - 9604 Procurement of Commercial Resources
    - 9605 Mineral Surveys
    - 9606-8 Unassigned
    - 9609 National Cadastral Survey Priorities
- 9610 Cadastral Services/ Administration
    - 9611 Application for Survey Without Cost to Applicant
    - 9612 Application for Survey With Costs Prorated
    - 9613 Application for Survey With Cost to Applicant
    - 9614 Special Surveys
    - 9615 Protraction Diagrams
    - 9616-19 Unassigned
- 9620 Cadastral Services/Recordation
    - 9621 Special Instructions
    - 9622 Assignment Instructions
    - 9623 Abstracting
    - 9624 Field Investigations
    - 9625 Geodesy
    - 9626-29 Unassigned
- 9630 Cadastral Services/Field Systems
    - 9631-36 Unassigned
    - 9637 Records Availability
    - 9638 National Archives
    - 9639 Unassigned
- 9640 Cadastral Services/External Relationships
- 9650 Geodesy
- 9660 Reserved
    - 9661 Protests
    - 9662 Appeals
    - 9663 Litigation
    - 9664-69 Unassigned

9670 Reserved
    9671 Monuments

    9672 Survey Evidence Maintenance

    9673 Survey Equipment Systems

    9674-79 Unassigned

9680 Reserved
    9681 Professional Societies

    9682 Seminars and Workshops

    9683 Professional Papers Publication

    9684 Professional Survey Authorities

    9685 Foreign Relations

    9686 Professional Surveyor Development

    9687-89 Unassigned

9690 Reserved
    9691 Public Land Survey/ Geographic Coordinate Data Base

    9692-99 Unassigned

ACCESSING AND USING THE BUREAU'S DATA ELEMENT DICTIONARY (DED)

THROUGH THE SC HONEYWELL DPS-8000 MAINFRAME COMPUTER

1. **YOU CAN CONDUCT SEARCHES FOR DED APPLICATIONS, AUTOMATED PROGRAM "KEY NAMES", DATA ELEMENTS AND ACTION CODES.**

   A. **AT THE * PROMPT, TYPE DBT/KEYINQ**

      - ***THIS LETS YOU QUERY THE DED WITH KEY WORDS THAT FIT YOUR RESOURCE/PROGRAM***

   B. **AT THE * PROMPT, TYPE DBT/DICRPT**

      - ***THIS LETS YOU REQUEST PRINTOUTS OF DATA ELEMENTS***
      - ***YOU CAN EITHER DIRECT YOUR PRINTOUTS TO THE SC PRINTER AND HAVE THEM MAIL TO YOU OR TO YOUR STATE OFFICE DPS-6+ COMPUTER PRINTER; E.G., "IP" FOR IDAHO.***

   C. **TO EXIT EITHER DBT PROGRAM, TYPE "X" AND THE "ENTER" KEY. FOLLOW STANDARD DPS-8000 COMPUTER EXITING PROCEDURES.**

2. **YOU WILL BE GIVEN A "SNUMB" NUMBER FOR YOUR PRINTOUTS. BE SURE AND WRITE THIS SNUMB NUMBER DOWN AND KEEP IT UNTIL YOU ACTUALLY GET YOUR REQUESTED PRINTOUT. THE SNUMB NUMBER IS THE ONLY WAY THAT A MAINFRAME COMPUTER PRINTOUT CAN BE TRACKED DOWN!**

DOWNLOADING DED DATA ELEMENTS FROM THE DPS-8000 TO YOUR PERSONAL COMPUTER (PC)

I. SPECIAL NOTES:

> **SINCE THE DED IS CONTINUALLY BEING UPDATED, IT IS BEST TO USE THE DED AND ITS DE'S IN AN ON-LINE, INTERACTIVE MODE TO ENSURE YOU ARE USING THE MOST RECENT, APPROVED DE'S.**

> **IF YOU DOWNLOAD DE'S TO YOUR PC, AND BEFORE YOU GO FINAL WITH ANY AUTOMATED SYSTEM OR PROCESS THROUGH LCM, ALWAYS CHECK THE DE'S IN THE DED ON-LINE TO ASSURE THAT THE DE INFORMATION YOU HAVE IS UP-TO-DATE.**

> **YOU WILL RECEIVE ASCII TEXT DATA FILES AS THE OUTPUT PRODUCTS TO YOUR PC. ONCE YOU HAVE THE ASCII FILE, YOU CAN CONVERT THE DATA TO ANOTHER DATA FORMAT; E.G., WORD PERFECT 5.1.**

> **KEEP A PRINTED COPY OR KNOW HOW TO GET COMPUTER ACCESS TO THOSE DATA ELEMENTS AND STANDARDS THAT YOU USE MOST OFTEN.**

II. TECHNICAL PROCEDURE FOR DOWNLOADING DATA ELEMENT DICTIONARY (DED) DATA ELEMENTS (DE) FROM THE HONEYWELL DPS-8000 MAINFRAME COMPUTER TO BLM PERSONAL COMPUTERS (PCs) USING SOFTERM DATA COMMUNICATIONS SOFTWARE:

THE INFORMATION PRESENTED HERE IS COURTESY OF THE DENVER WASHINGTON OFFICE DATA ADMINISTRATION STAFF (DWO-445).

KEEP IN MIND THAT THE DED AND THE BUREAU'S DES ARE CONTINUALLY BEING UPDATED. THUS, THE BEST WAY TO USE THE DED IS THROUGH AN ON-LINE, INTERACTIVE MODE, TO BE SURE THAT YOU GET THE LATEST INFORMATION. JUST REMEMBER THAT IF YOU DO DOWNLOAD DES TO YOUR PC, BEFORE YOU GO FINAL WITH ANY AUTOMATED SYSTEM OR PROCESS AN APPLICATION PROGRAM THROUGH LCM, CHECK THE DES AGAIN TO SEE IF THERE ARE ANY INTERIM CHANGES. CONTACT YOUR IRM STAFF OR SDA FOR ADDITIONAL INFORMATION.

A. PROCEDURE FOR DOWNLOADING DES FROM THE BUREAU DED TO PC'S, USING SOFTERM DATA COMMUNICATIONS SOFTWARE:

THIS PROCEDURE IS NOTHING NEW. IT HAS JUST BEEN PUT INTO ITS CONTEXT WITH DATA ADMINISTRATION. THE DED RESIDES ON THE BUREAU'S HONEYWELL MAINFRAME COMPUTER IN DENVER:

1. *YOU MUST FIRST HAVE A VALID DPS-8000 USER ID, PASSWORD, ETC. CONTACT YOUR IRM BRANCH TO OBTAIN THESE.*

2. *AT THE * PROMPT, AFTER YOU GET INTO THE DPS-8000, ENTER THIS COMMAND: DBT/KEYINQ. THIS MEANS YOU ARE REQUESTING A KEY WORD INQUIRY FROM THE DED.*

3. *THE KEYINQ PROGRAM WILL THEN ASK YOU FOR EITHER A KEY WORD TO SEARCH FOR OR A SPECIFIC DATA ELEMENT NUMBER.*

4. *ENTER YOUR KEY WORD OR DE NUMBER AND SEE IF THERE IS SOMETHING THAT YOU WANT TO USE. NOTE: THERE IS NO WAY TO TELL FROM YOUR SCREEN WHAT THE BYTE SIZE OF THE DE IS. THEREFORE, IT IS ALWAYS BETTER TO SEE WHAT YOU WILL GET BEFORE YOU DOWNLOAD ANYTHING!*

   TRY SCROLLING THROUGH THE DE TO GET A FEELING FOR ITS SIZE, PLUS PRACTICE AND EXPERIENCE. THE DE 0066 FILE IS ABOUT 65 KBYTES. THE DWO CAN HELP YOU OBTAIN DE BYTE SIZE INFORMATION.

   AFTER YOU FINISH DOWNLOADING A FILE, NOTE THE TIME IT TAKES TO DOWNLOAD IT AND ITS SIZE IN BYTES. THIS WILL HELP YOU THE NEXT TIME YOU WANT TO DOWNLOAD THE FILE. IF THE FILE IS LARGE (SOMEWHERE OVER 50 KBYTES), IT MAY BE BEST TO DOWNLOAD THE FILE EARLY IN THE MORNING OR SOME OTHER TIME WHEN YOU ARE NOT AS BUSY AND THE MAINFRAME COMPUTER IS NOT RECEIVING HEAVY USE.

5. *ONCE YOU HAVE DECIDED ON A SPECIFIC DE, AND BEFORE YOU HIT THE CR OR ENTER KEY ON YOUR PC TO ACTUALLY CALL UP THE DE, ENTER THE SOFTERM COMMANDS FOR "CAPTURING TRANSPARENT TO DISK", THE DISK LOCATION AND FILE NAME; I.E., "ALT 1" UTILITY FUNCTIONS, THEN "F8", FOLLOWED BY THE DISK AND ANY RELEVANT FILE NAME, SUCH AS - C:\EMAIL\DE0066.TXT. THIS MEANS THAT WHEN YOU PROCEED TO GET DE INFORMATION, IT WILL AUTOMATICALLY GO TO THE DISK AND ITS FILE DESTINATION AS AN ASCII TEXT FILE.*

6. *ONCE YOU ARE FINISHED CAPTURING THE DE TO DISK, ENTER "ALT 1" AND THEN "F8" TO CANCEL DISK CAPTURE BEFORE YOU LEAVE SOFTERM AND THE DPS-8000. THEN, YOU WILL HAVE THE DE IN AN ASCII FILE ON DISK. AFTER THIS, YOU CAN THEN CONVERT THE TEXT FILE TO WORDPERFECT, ETC. IF YOU DO CONVERT IT TO WP 5.1, SOME EXTRA HINTS ARE:*

   USE THE "SHIFT F10" COMMAND IN WORD PERFECT TO PULL THE FILE IN FROM ASCII TEXT.

   SET LEFT AND RIGHT MARGINS BOTH TO "0" TO PREVENT LINE WRAPPING, AND WHEN YOU PRINT, MAKE SURE THE PRINT FONT IS NOT "SCALABLE".

7. *WHEN YOU HAVE COMPLETED YOUR WORK IN THE DBT\KEYINQ PROGRAM, ENTER A CAPITAL LETTER "X" TO GET OUT AND BACK TO THE * PROMPT. THEN ENTER "BYE" TO EXIT THE DPS-8000 AND RETURN TO IDAHO'S DATA COMMUNICATIONS NETWORK.*

IF YOU NEED HELP WITH THE TECHNICAL PART OF THE MAINFRAME SIGN-ON PROCEDURE OR DOWNLOADING, CONTACT YOUR IRM STAFF. FOR ASSISTANCE WITH THE DED AND ITS USE, PLEASE CONTACT YOUR STATE DATA ADMINISTRATOR.

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
WASHINGTON, D.C. 20240

November 1, 1993

In Reply
Refer To:
1283(871)

Memorandum

To: ALMRS/Modernization Project Manager

From: Chief, Division of Information Resources Management

Subject: Corporate Data Dictionary

This memorandum clarifies the BLM's requirements for a corporate data dictionary and reiterates BLM policy that a single Bureauwide corporate data dictionary will be deployed as part of the Modernization "information highway".

The BLM has requirements for both the data dictionary that is coupled with Informix and a FIPS 156-compliant data dictionary, an Information Resource Dictionary System (IRDS).

The IRDS is the key to moving the BLM towards consistent management of all corporate data standards. The IRDS holds metadata information about the BLM's data elements, such as data element name and definition, data type, storage format, data codes, data validation rules, user access and modification permissions and relationships among data elements. The IRDS will be managed by the data administrators in the BLM.

In contrast, the Informix data dictionary directly supports the processing of data within the database management system. This data dictionary holds information about data structures specific to each application. Initially, management of the Informix data dictionary will be the concern of database designers. Once an application is operational, the Informix data dictionary will be managed by database and/or system administrators.

The BLM has need for the IRDS this fiscal year. The corporate resources data standards will be completed and ready for Bureauwide distribution by March, 1994. These data standards must be available in a form that can be used by ongoing AIM projects, such as Automated Fluid Minerals Support System (AFMSS) and Monitoring Information and Data Analysis System (MIDAS). The IRDS is required to support system analysts in defining and cross-referencing complex functional and data requirements.

I am requesting that the Washington Office, Service Center and New Mexico State Office be provided with the IRDS product as part of their pilot installation. Additionally, each State Office will require access to the IRDS this fiscal year. Infrastructure deployment to other BLM offices should include provisions for access to the IRDS product at all organizational levels.

Please direct any questions you have to Renée Duval, WO-872, at (202)452-5017.

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
WASHINGTON, D.C. 20240

January 5, 1994

In Reply
Refer To:
1283(870)

Memorandum

To: Chief, Office of IRM/Modernization

From: Chief, Division of Information Resources Management

Subject: Dictionary Capability for Modernization

The data administration and database management needs of the BLM's ALMRS/Modernization program require that the following actions be taken:

- Use the Informix data dictionary for the Administrative Rehost systems which move to the Informix environment;

- Use the Informix data dictionary (for reference purposes) for the Administrative Rehost systems which remain in the flat file environment;

- Use the Informix data dictionary for ALMRS/IOC development;

- Do not rehost the Honeywell Data Element Dictionary;

- Develop the operating procedures necessary for the use of the Informix data dictionary in both development and production modes.

The Information Resources Dictionary System (IRDS) should be made available as soon as possible at both the Washington Office (WO) and the Service Center. This repository product will be used to meet the BLM's immediate data standards and information locator requirements. Longer term, use of the IRDS in the system development environment will be initiated.

Please let me know when the IRDS will be available for our use here in the WO. The Bureau Data Administrator should also be notified of and involved in any engineering change proposals which affect the IRDS product.

/s/Terrance F. Call

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
WASHINGTON, D.C. 20240

December 7, 1992

In Reply
Refer To:
1283 (873)

EMS TRANSMISSION 12/9/92
Instruction Memorandum No. 93-80
Expires 9/30/94

To: AD's, SD's, SCD, and BLM D-BIFC

From: Director

Subject: Standard Naming Convention Policy for Data Elements

PURPOSE

Standard data element naming conventions within the Bureau of Land Management (BLM) will ensure data accessibility across systems and users. Structured format and content for data element documentation are required to:

- Minimize costs associated with the maintenance of identical information in different formats;
- Reduce needless duplication of data collection and storage;
- Reduce redundant data through consolidation of synonymous and overlapping data elements;
- Increase opportunities for sharing data among different BLM users; and
- Enhance consistent interdisciplinary use of information.

Uniformly named data elements are essential to the effective implementation of the Automated Land Management Record System (ALMRS)/Modernization relational data bases.

Standard naming conventions ensure that names for all BLM data elements are clear, brief, unique, context-free, and conform to rules of syntax.

BACKGROUND

The BLM's Information Resources Management (IRM) Strategic Plan (November 1991) addresses data standardization and standard naming conventions. Data standardization supports the BLM's long range Mission/Goal and IRM Goal of developing partnerships with a variety of entities (Section 2.d.#2). Through these partnerships, BLM will further the standardization and exchange of information on land, natural resource, socio-economic, and environmental conditions. The BLM needs standards for data resources to ensure data can be shared between offices and with partners for more efficient, comprehensive and up-to-date assessments of public land resources and land status.

The BLM Manual 1283 - Data Administration (Section .3) describes the need for data resources to be standardized: "Effectively managing data for maximum use means that data must be available to a wide variety of staff and must carry the same names, definitions and values for each user." It specifies that, as new Bureauwide and Statewide systems are developed and implemented, all stored data must comply with the BLM standards for naming data.

POLICY

The conventions described below will be applied to all automated projects, systems, or applications being developed in the BLM. Requests for exceptions should be addressed to Director, WO-873.

Naming Convention

A data element is the smallest, most basic logical division of information about a data entity. For example, for the entity CUSTOMER, some data elements may be CUSTOMER PHONE NUMBER, CUSTOMER BIRTH DATE, and CUSTOMER ZIP CODE NUMBER.

The structure of the naming convention to be used in the BLM is:

SUBJECT WORD MODIFIER(S) CLASSWORD

where --

- SUBJECT WORD is what the element contains information about,
- MODIFIER(S) describes the specific element, and the
- CLASSWORD indicates the type or category of information the element reflects.

Attachment 1 is a list of **some** of the SUBJECT WORDS developed to date in applying the standard naming convention to the data elements developed by the data set teams. This list of SUBJECT WORDS is representative not exhaustive.

Attachment 2 is a list of the CLASSWORDS used in the Logical Data Model and in naming data set report elements. This is the complete inclusive list of CLASSWORDS to be used.

Conditions/Qualifications

This guidance does not address abbreviation, hyphenation, punctuation, or length limitations for system-specific requirements regarding data element names. If all data elements are named consistently according to the structure given above using complete words/names, system-specific requirements can be addressed on a case-by-case basis.

If you use abbreviations in a data element name, be sure they comply with those currently in the Data Element Dictionary data element 0066. If you use acronyms, spell each out in the definition or descriptive name section of the element's documentation.

Documentation Components

Standard/required components of data element documentation include:

- Definition
- Standards
- Codes/Domain (if appropriate)

See Attachment 3 for several examples of data element documentation. Other supplementary information may be developed and maintained for data elements as long as the basic components above are addressed.

Approval Process

As you develop data elements for a project, system, or application, submit the names and documentation to the Data Administrator for your office (Assistant Director, State Office, or Center). The originating office Data Administrator will coordinate review and approval of the elements by the appropriate Headquarters-level program data steward. The originating office Data Administrator will provide documentation of the approved data elements to you as originator, and to the network of all other Data Administrators as reference material. The Bureau Data Administrator will maintain a Bureauwide repository of data element documentation pending its appropriate disposition in the ALMRS/Modernization data dictionary.

If you have questions or need additional information, contact Renee Duval, Bureau Data Administrator at (202) 653-2822.

Signed
Roger L. Hildebeidel
Acting Assistant Director,
Management Services

Authenticated
Dawn Slaughter
Directives,WO855

3 Attachments
1 - Subject Words Used in Standard Naming of Data Set Team Reports (Examples) (1 p)
2 - Approved Classwords (1 p)
3 - Examples of Data Element Documentation (1 p)

Subject Words Used in Standard Naming of Data Set Team Reports (Examples)

Administrative Unit
Agency
Agreement
Animal
Appraisal
Authorization
Bond
Cave
Comment
Contract
Cruise
Customer
DEIS (Draft Environmental Impact Statement)
Designation
Document
Ecological Site
Facility
FEIS (Final Environmental Impact Statement)
Forage
Interpretive Material
Inventory
Land Area
Orchard
Plan
Plan Decision
Plan Implementation
Plan Monitoring
Plant Species
Population
Protest
Record of Decision
Recreation Use
Sample
Seed
Site Writeup Area
Species
Stand
Treatment
Tree
Unauthorized Use

Approved Classwords

ADDR	Address. This is not a formatted attribute; each portion of an address would require a separate attribute (example: street address).
AMT	Amount. Monetary amount.
CD	Code. An attribute which is represented by a coded field. A code is usually six or fewer alpha or numeric characters, and may have associated descriptions.
DATE	Calendar date. The format standard is MMDDYYYY. If the date is not shown in this format, either the repository description will provide the displayed format or a different attribute will be used.
FRAC	Fraction. An alpha/numeric attribute used in legal land descriptions or to show a customer's interest in the land (example: 1/4).
ID	Identifier. An artificial, system-assigned number which identifies a unique occurrence of an element.
MEAS	Measurement. Gauged or scaled extent, capacity, dimension, or frequency. Use when a unit of measurement is clearly specified or identified.
NAME	Name. Name of a person, place, or thing. This is not a formatted attribute; each portion of a name would require a separate attribute (example: first name).
NO	Number. A non-system number. An alpha/numeric attribute. May be used to describe a non-system assigned identifier.
PCT	Percent. A positive number whose value cannot exceed 100.
QTY	Quantity. A numeric, non-monetary sum or count.
TIME	Time of day.
TXT	Text. Data having an unstructured content.
YR	Year. Calendar unless Fiscal is specified.

Examples of Data Element Documentation

Name: Species Abundance Code

Definition: Relative commonness of a species of animals that occupy a location or area based on estimates of the normal density of the species on an average adjacent habitat, with "Common" being the midpoint.

Standards: Alpha codes (see below)

Codes: AB = Abundant (best habitat or highest density found)
AS = Absent
OC = Occasional
UN = Uncommon
CO = Common (average density)
RA = Rare (rarely found)
HY = Hypothetical (occurrence speculated but not confirmed)

Name: Species Common Name

Definition: Professionally recognized common name for a species derived from the NOAA/NODC Animal Taxonomic database. This data element should tie to animal species codes (DED #6554), which will include fish and invertebrate species in the future.

Standards: This element will be drawn from the taxonomic file maintained by NOAA/NODC and will be linked to the taxonomic code. There are currently 77,500 entries (NODC Taxonomic Code version 5.1, User Services Branch, NOAA/NESDIS E/OC21, Washington, D.C. 20235).

Codes: Not applicable

Name: Facility Design Capacity Quantity

Definition: The optimum number of people or animals a site can accommodate within design restraints.

Standards: Numeric entry expressed as a whole number of people or animals.

Codes: Not applicable

LIST OF BLM DATA SETS AND TEAMS
1993

TOTAL OF 30 DATA SETS BUREAUWIDE

(In Alphabetical Order)

Animals
Air Resources
Aviation
Cave Resources
Cultural Resource Management
Fire Management
Fluid Minerals (Oil & Gas)
Forest Management
Geologic Formation and General Rock Type
Hazardous Materials
Lands Resource Management
Land Use Planning - Development
Land Use Planning - Implementation
Locatable Minerals -- Mining Law
Mineral Materials
Mineral Resource Inventory
Paleontological Resource Management
Projects (Physical Facilities)
Range Management
Recreation Resources Management
Socioeconomic
Soils
Solid Leasable Minerals
Vegetation
Visual Resource Management
Water Resources
Watershed Resources Management
Wild Horses and Burros
Wilderness Resources Management
Wildlife Resources Management

Executive Order 12906

On April 11, 1994, President Clinton signed Executive Order 12906, Coordinating Geographic Data Acquisition and Access: The National Spatial Data Infrastructure.

The order directs all Federal agencies to contribute to the development of the National Spatial Data Infrastructure (NSDI) and lays out key activities that Federal agencies must conduct in conjunction with State and local governments, academia, and the private sector to ensure the evolution and growth of the NSDI.

The national Performance Review recommended that the Executive Branch develop a coordinated National Spatial Data Infrastructure to support public and private sector applications of geospatial data in such areas as transportation, community development, agriculture, emergency response, environmental management, and information technology.

Purpose is to avoid wasteful duplication of effort and promote effective and economical management of resources by Federal, state, local, and tribal governments.

"National Spatial Data Infrastructure" means the technology, policies, standards, and human resources necessary to acquire, process, store, distribute, and improve utilization of geospatial data.

"Geospatial Data" means information that identifies the geographic location and characteristics of natural or constructed features and boundaries on the earth. This information may be derived from, among other things, remote sensing, mapping, and surveying technologies. Statistical data may be included in this definition at the discretion of the collecting agency.

"National Geospatial Data Clearinghouse" means a distributed network of geodata producers, managers, and users linked electronically.

The Federal Geographic Data Committee (FGDC) shall coordinate the Federal Government's development of the NSDI.

The Secretary, through the FGDC, ...shall take steps within 6 months of the date of this order, to establish an electronic National Geospatial Data Clearinghouse for the NSDI. The Clearinghouse shall be compatible with the National Information Infrastructure to enable integration with that effort.

Beginning 9 months from the date of this order, each agency shall document all new geospatial data it collects or produces, either directly or indirectly, using the standard under development by the FGDC, and make that standardized documentation electronically accessible to the Clearinghouse network.

Within one year of the date of this order, agencies shall adopt a schedule, developed in consultation with the FGDC, for documenting, to the extent practicable, geospatial data previously collected or produced, either directly or indirectly, and making that data documentation electronically accessible to the Clearinghouse network.

Within 1 year..., each agency shall adopt a plan, in consultation with the FGDC, establishing procedures to make geospatial data available to the public, to the extent permitted by law, current policies, and relevant OMB circulars...

Within 1 year, each agency shall adopt internal procedures to ensure that the agency accesses the Clearinghouse before it expends Federal funds to collect or produce new geospatial data, to determine whether the information has already been collected by others, or whether cooperative efforts to obtain data are possible.

Agencies assigned responsibilities for data categories by OMB Circular No. A-16 shall develop, through the FGDC, standards for those data categories, so as to ensure that data produced by all agencies are compatible.

Federal agencies collecting or producing geospatial data, either directly or indirectly (e.g., though grants, partnerships...), shall ensure, prior to obligating funds for such activities, that data will be collected in a manner that meets all relevant standards adopted through the FGDC process.

In consultation with State, local, and tribal governments and within 9 months of the date of this order, the FGDC shall submit a plan and schedule to OMB for completing the initial implementation of a national digital geospatial data framework by January, 2000 and for establishing a process of ongoing data maintenance.

The data shall include geospatial data that are significant, in the determination of the FGDC, to a broad variety of users within any geographic area or nationwide.

At a minimum, the plan shall address how the initial transportation, hydrology, and boundary elements of the framework might be completed by January, 1998 in order to support the decennial census of 2000.

Content Standards for Digital Geospatial Metadata

Overview

At its June 8, 1994, meeting, the Federal Geographic Data Committee (FGDC) approved the "Content Standards for Digital Geospatial Metadata." Metadata, or "data about data," describe the content, quality, condition, and other characteristics of data. The standard specifies the information content of metadata for a set of digital geospatial data. The purpose of the standard is to provide a common set of terminology and definitions for documentation related to these metadata.

The FGDC invites and encourages organizations to use the standard to document their geospatial data. The main reason to document data is to maintain an organization's investment in its geospatial data. Organizations that do not document their data often find that, over time or because of personnel changes, they no longer know the content or quality of their data. Organizations then cannot trust the results generated from the data in which they have invested their time and resources. In addition, the lack of information about other organizations' data often leads to a needless duplication of effort.

The standard specifies information that helps prospective users to determine what data exist, the fitness of these data for their applications, and the conditions for accessing these data. Metadata also aid the transfer of data to other users' systems.

On April 11, 1994, President Clinton signed Executive Order 12906, "Coordinating Geographic Data Acquisition and Access: The National Spatial Data Infrastructure." This executive order instructs Federal agencies to use the standard to document new geospatial data beginning in 1995, and to provide these metadata to the public through the National Geospatial Data Clearinghouse.

The Standard

The standard provides a common set of terminology and definitions for the documentation of geospatial data. The standard establishes the names of data elements and groups of data elements to be used for these purposes, the definitions of these data elements and groups, and information about the values that are to be provided for the data elements. Information about terms that are mandatory, mandatory under certain conditions, and optional (provided at the discretion of the data provider) also is provided by the standard.

The major uses of metadata are:

- to help organize and maintain an organization's internal investment in spatial data,

- to provide information about an organization's data holdings to data catalogues, clearinghouses, and brokerages, and

- to provide information to process and interpret data received through a transfer from an external source.

The information included in the standard was selected on the basis of four characteristics that define the role of metadata:

- availability—data needed to determine the sets of data that exist for a geographic location.

- fitness for use—data needed to determine if a set of data meets a specified need.

- access—data needed to acquire an identified set of data.

- transfer—data needed to process and use a set of data.

These characteristics form a continuum in which a user moves through a number of choices to determine what data are available, to evaluate the fitness of data, to acquire the data, and to transfer and process the data. The order in which data elements are evaluated, and the relative importance of the data elements, will not be the same for all users or for all tasks that use metadata. In addition, users with different tasks or at different stages of evaluation may require (or prefer) that a set of information be available at different levels of abstraction or in different forms.

The standard defines data elements for the following topics:

Identification Information— basic information about the data set. Examples include the title, the geographic area covered, currentness, and rules for acquiring or using the data.

Data Quality Information—an assessment of the quality of the data set. Examples include the positional and attribute accuracy, completeness, consistency, the sources of information, and methods used to produce the data. Recommendations on information to be reported and tasks to be performed are in the Spatial Data Transfer Standard (Federal Information Processing Standard 173, 1992).

Spatial Data Organization Information—the mechanism used to represent spatial information in the data set. Examples include the method used to represent spatial positions directly (such as raster or vector) and indirectly (such as street addresses or county codes) and the number of spatial objects in the data set.

Spatial Reference Information—description of the reference frame for, and means of encoding, coordinates in the data set. Examples include the name of and parameters for map projections or grid coordinate systems, horizontal and vertical datums, and the coordinate system resolution.

Entity and Attribute Information—information about the content of the data set, including the entities types and their attributes and the domains from which attribute values may be assigned. Examples include the names and definitions of features, attributes, and attribute values.

Distribution Information—information about obtaining the data set. Examples include a contact for the distributor, available formats, information about how to obtain data sets online or on physical media (such as cartridge tape or CD-ROM), and fees for the data.

Metadata Reference Information—information on the currentness of the metadata information and the responsible party. Examples include currentness and information about the organization that provided the metadata.

The standard has sections that specify contact information for organizations or individuals that developed or distribute the data set, temporal information for time periods covered by the data set, citation information for both the data set and for information sources from which the data set was derived.

The standard does not specify how this information is organized in a computer system or in a data transfer, nor the means by which this information is transmitted or communicated to the user. The variety of means of organizing data in a computer or in a transfer, the differences between data providers in describing their data holdings because of varying institutional and technical capabilities, and the rapid evolution of means to provide information through the Internet for different purposes determined this decision.

Development of the Standard

The FGDC initiated work on the standard in June, 1992, with a forum on spatial metadata. At the forum, the participants agreed on the need for a standard on information content for metadata about spatial data. A committee of volunteers developed an initial draft content standard. This draft was slightly revised and offered for public review from October 1992 to April 1993. Extensive comments were received from the public. The FGDC's Standards Working Group revised the draft, which was provided for further review and testing in July 1993. Revised drafts were reviewed and tested again in January, March, and May 1994. The standard was approved by the FGDC on June 8, 1994.

Obtaining Copies of the Standard

The standard is available from:

FGDC Secretariat
c/o U.S. Geological Survey
590 National Center
Reston, Virginia 22092;
telephone: (703) 648-5514;
facsimile: (703) 648-5755;
or Internet gdc@usgs.gov.

The standard is available by anonymous file transfer protocol (FTP) from:

ftp://fgdc.er.usgs.gov/gdc/metadata/meta.6894.wp5

for WordPerfect 5.1 (remember to transfer in binary/image mode!) or

ftp://fgdc.er.usgs.gov/gdc/metadata/meta.6894.ps

for PostScript.

The WordPerfect file is set up for 10-point, Times Roman font on an HP LaserJet 4 printer. It can be printed using other fonts or printers, but the sections that refer to page numbers (i.e. the table of contents and list of data elements with page numbers) may have to be regenerated. The file contains codes that aid efforts to regenerate the page numbers.

Users that have a World Wide Web (WWW) browser (such as Mosaic) can access the FGDC server at

ftp://fgdc.er.usgs.gov/gdc/html/fgdc.html

The FGDC also is developing implementation guidelines for the clearinghouse. The guidelines are in the directory:

ftp://fgdc.er.usgs.gov/gdc/clearinghouse/

Federal
Geographic
Data
Committee

The Value of Metadata

Two very similar paintings of circus performers by Picasso from 1904 are put on the auction block; one brings tens of millions of dollars, the other hundreds of thousands. What is the difference?

In one case, the ownership of the painting can be traced through sales slips and auction house records back to the estate of Picasso's dealer. The other painting appeared suddenly on the art market. It looks almost identical, but lacking documentation, how can one be sure it's authentic?

Just as a work of art can change hands many times, so can geospatial data. Once created, data can travel almost instantaneously through a network and be used for any number of different kinds of spatial analysis. Thus transformed, these data can be retransmitted to another user. Change is the essence of geospatial data in a networked environment. The word metadata shares the same Greek root as the word metamorphosis. Meta means change and metadata, or "data about data" describe the origins of and track the changes to geospatial data.

Metadata can help the city planner, the graduate student in geography, or the forest manager find and use geospatial data, but they also benefit the primary creator of the data by maintaining the value of the data and assuring their continued use over a span of years.

What are metadata?
The concept of metadata is familiar to most people who deal with spatial issues. A map legend is pure metadata. The legend contains information about the publisher of the map, the publication date, the type of map, a description of the map, spatial references, the map's scale and its accuracy, among many other things. Metadata are simply that type of descriptive information applied to a digital geospatial file. They're a common set of terms and definitions to use when docu-menting geospatial data. Most digital geospatial files now have some associated metadata.

Why bother with metadata?
Metadata helps people who use geospatial data find the data they need and determine how best to use it. Metadata benefit the data producing organization as well. As personnel change in an organization, undocumented data may lose their value. Later workers may have little understanding of the contents and uses for a digital data base and may find they can't trust results generated from these data.

Lack of knowledge about other organizations' data can lead to duplication of effort. It may seem burdensom to add the cost of generating metadata to the cost of data collection, but in the long run it's worth it.

How can Metadata be produced?
The information needed to create metadata is often readily available when the data are collected. A small amount of time invested at the beginning of a project may save money in the future. Data producers and users cannot afford to be without documented data. The initial expense of documenting data clearly outweighs the potential costs of duplicated or redundant data generation. A recently developed metadata standard provides a systematic way to collect metadata.

Why use a standard?
When producing a map, the cartographer must organize all the descriptive information that goes into the map legend in a particular format. Titles are put in a specific place, tic marks are made a certain way, meters may be used instead of feet, and so forth. A metadata standard is simply a common set of terms and definitions that describe geospatial data.

What standard should be used?
The Federal Geographic Data Committee (FGDC) recently adopted a content standard for metadata. According to an Executive order signed by President Clinton on April 11, 1994, all Federal agencies will begin to use this standard to document newly created geospatial data as of January, 1995. This standard provides a consistent approach and format for the description of data characteristics.

The standard was developed over a two-year period, with extensive review by professionals at all levels of government. The standard provides a way for data users to know:

- what data are available
- whether the data meet their specific needs
- where to find the data
- how to access the data.

Because these standards are now in place, and large amounts of Federal data will be available in these standards, data managers from State and local governments and private industry will have an incentive to adopt these standards to document their own data.

The FGDC is also sponsoring the creation of a National Geospatial Data Clearinghouse which will point users toward the spatial data that are best for their particular project. The intent is not to centralize all geographic data in one location, but to provide links through the Internet to distributed sites where data are produced or maintained.

Managers who document their data using the metadata standards will provide these metadata to the National Geospatial Data Clearinghouse so that users can easily find data. Easier access to data will mean that a company's customers or an agency's cooperators could be increased.

Why use metadata?
Twenty-five years ago, humans landed on the Moon. Data from that era are still being used today, and it is reasonable to assume that today's geospatial data could still be used in the year 2020 and beyond to study climate change, ecosystems, and other natural processes. Metadata standards will increase the value of such data by facilitating data sharing through time and space.

The value of Picasso's painting did not depend solely on his having signed the work, a signature can easily be forged. Information about the painting, where it came from and where it had been, increased its value. So when a manager launches a new project, investing a small amount of time and resources at the beginning will pay dividends in the future.

For more information
If you would like to explore available training or seek information about the FGDC Metadata Standard or the National Geospatial Data Clearinghouse contact:

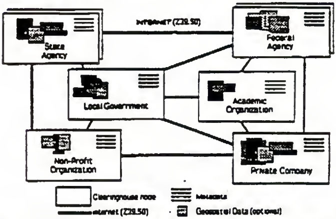
FGDC Secretariat
c/o U.S. Geological Survey
590 National Center
Reston, Virginia 22092

Telephone: (703) 648-5514
Fax: (703) 648-5755
Internet: gdc@usgs.gov
Anonymous ftp: fgdc.er.usgs.gov

Federal
Geographic
Data
Committee

National Geospatial Data Clearinghouse

The National Geospatial Data Clearinghouse is a distributed, electronically connected network of geospatial data producers, managers, and users. The clearinghouse will allow its users to determine what geospatial data exist, find the data they need, evaluate the usefulness of the data for their applications, and obtain or order the data as economically as possible.



The clearinghouse is an electronically connected network that has information about geospatial data.

Why is it needed?

Like the information-based economy of which it is a part, the geospatial data community is in the midst of change. Decreasing costs and the increasing capabilities of hardware and software are lowering the initial investment needed for technology and are increasing demands for geospatial data. But even with billions of dollars going into geospatial data production, few users can answer the basic question, "Where are the data?" The result is that agencies and the public spend money collecting data that may already exist.

Electronic networking capabilities increasingly assist communication within the geospatial data community. There is still much work to be done to move from traditional means of communicating about geospatial data to using the emerging information infrastructure. The clearinghouse provides a means to inventory, document, and share geospatial data. For data users, the clearinghouse makes data easier to find and access.

As part of their participation in the National Spatial Data Infrastructure (NSDI), Federal agencies are beginning to provide data and use the clearinghouse. On April 11, 1994, President Clinton signed Executive Order 12906, "Coordinating Geographic Data Acquisition and Access: The National Spatial Data Infrastructure." The order instructs Federal agencies to use the Content Standards for Digital Geospatial Metadata to document new geospatial data beginning in 1995 and to provide these metadata to other agencies and to the public through the clearinghouse.

How does it work?

As part of the NSDI, which is building on initiatives such as the National Information Infrastructure, the clearinghouse allows data providers to make known what geospatial data exist, the condition of these data, and instructions for accessing these data. Each data provider describes available data in an electronic form and provides these descriptions (or "metadata") to the network using a variety of software tools. In addition to these metadata, the provider also may provide access to the geospatial data. The data described in the clearinghouse may be located at the sites of data producers or, where appropriate, at sites of designated data disseminators throughout the country.

The clearinghouse uses the Internet to link computer nodes that contain information about geospatial data. The Internet is a global "network of networks" that enables computers of all kinds to communicate and share services throughout much of the world. The Internet currently connects more than 2 million host computers and 15 to 20 million users in more than 100 countries.

Using the Internet, data users can search the descriptions provided by producers to locate data that are suitable for their applications. A public-domain software tool known as WAIS (Wide Area Information Servers) enables users to perform queries for data over the network. A recent enhancement to WAIS allows users to search on the basis of geographic coordinates. WAIS uses a communications protocol known as Z39.50, which is emerging as an international standard. In addition, the rapidly expanding World Wide Web (WWW) technologies, including browse software such as Mosaic, provide gateways to WAIS servers, and allow graphic or forms-based queries for data.

What if the desired data don't exist?
As the clearinghouse evolves additional functions will be supported, such as the capability for producers to publicize data that are being prepared or are planned and for users to advertise their data needs. These capabilities will foster communication between the users and producers, which will encourage dialogue on new product needs and developments, will help to form partnerships for data production, and will minimize duplication in data collection. This communication is vital to ensuring that the NSDI continues to be responsive to the needs of the community.

What will it cost?
The clearinghouse will be distributed across thousands of data producers and users, and so the total cost is not known and is difficult to estimate. Costs will be distributed among organizations and will primarily be borne by data producers. Costs include those for the hardware needed to store and provide the metadata, for the software to access the metadata, for activities to collect and maintain the metadata that are provided to users, and for telecommunications charges. The benefits of many of these items will be shared with other applications within an organization. Data users will incur some costs in software to search for data and fees for network usage.

What are the benefits?
The ability to search for and make sense of data in an increasingly information driven world will be one of the most critical required skills in the future. The use of GIS technologies is spreading and the clearinghouse is responding to the demands of this community of users for ways to manage and share geospatial data. There will be increasing demands for clearinghouse activities to sift through the billions of bytes of data on electronic networks to find useful information. The clearinghouse effort will provide the foundation for finding, sharing, and using geospatial data.

Who is developing it?
People like you. Many contributors from the geospatial data community are collaborating on this project, including Federal, State, and local governments, academia, and the commercial sector. The Federal Geographic Data Committee (FGDC) is serving as the contact for prospective participants.

How can I participate?
Data Providers

- Learn and use the metadata standard. Much of the information requested by the standard is available during data production. Begin to record this information and provide it to others.
- Investigate means to provide metadata to the clearinghouse. Set up a clearinghouse node and provide metadata on the Internet. Or work with others to establish a site that provides the metadata on behalf of the group.
- Encourage vendors to provide the tools needed to participate in the clearinghouse. Vendors need to hear from you about what's important.

Data Users

- Learn about the metadata standard and provide feedback to producers on the types of information that would help you the most. Encourage producers to provide metadata through the clearinghouse.
- Investigate means to access to the Internet. Learn and use software such as WAIS and WWW, and use the clearinghouse. Provide feedback on improvements needed to make your use more efficient.
- Encourage vendors to provide the tools needed to use the clearinghouse as part of their products.

Additional Information
For more information contact:

FGDC Secretariat
c/o U.S. Geological Survey
590 National Center
Reston, Virginia 22092;
telephone: (703) 648-5514;
facsimile: (703) 648-5755;
or Internet gdc@usgs.gov

Implementation guidelines about the clearinghouse for Federal agencies are available by anonymous file transfer protocol (FTP) from:
ftp://fgdc.er.usgs.gov/gdc/clearinghouse/chguide.6894.wp5
for WordPerfect 5.1 (transfer in binary/image mode),
ftp://fgdc.er.usgs.gov/gdc/clearinghouse/chguide.6894.ps
for PostScript, or
ftp://fgdc.er.usgs.gov/gdc/clearinghouse/chguide.6894.txt
for ASCII text.

Users that have WWW browser software (such as Mosaic) can access the FGDC server at:
ftp://fgdc.er.usgs.gov/gdc/html/fgdc.html

The metadata standard is in the directory:
ftp://fgdc.er.usgs.gov/gdc/metadata/

The WAIS server and client software is available in the directory:
ftp://waisqvarsa.er.usgs.gov/wais/

WWW server and client software is available at many locations including:
ftp://ftp.ncsa.uiuc.edu/

Two Internet discussion groups contain items related to the NSDI, metadata, clearinghouse, and other subjects:

NSDI-L - Issues, policies, and technical questions about the NSDI. Unmoderated.

To subscribe: send email to
listproc@grouse.umesve.maine.edu,
with the following body:
subscribe NSDI-L <your name>
(e.g., Jane Smith)
To submit: send email to
NSDI-L@grouse.umesve.maine.edu

Geoweb - Archiving, cataloging, and retrieving geospatial information on the Internet and the WWW. Unmoderated.

To subscribe: send email to
majordomo@census.gov,
with the following body:
subscribe geoweb <your Internet address> (e.g., jsmith@org.gov)
To submit: send email to
geoweb@census.gov

National Digital Geospatial Data Framework: A Status Report

While applications of digital geospatial data vary greatly, users have a recurring need for a few common themes of data. Because of a lack of coordination, common approaches, and investment, these needs are not being met. This situation results in important information not being available for many areas, and many organizations supporting data that are basically the same for other areas. A system does not exist to maintain and manage the variety of common information being collected by the public and private sector.

Representatives from local, State, and Federal agencies are developing the concept of a framework of geospatial data to meet this need. This Framework Working Group, organized by the Federal Geographic Data Committee (FGDC), is identifying the purpose, goals, and content of the framework, how it would work, and reasons why organizations should participate. This fact sheet describes the status of the working group's discussions.

Purpose and Goals
The framework is a basic, consistent set of digital geospatial data and supporting services that will:

- provide a geospatial foundation to which an organization may add detail and attach attribute information.
- provide a base on which an organization can accurately register and compile other themes of data.
- orient and link the results of an application to the landscape.

The framework should be widely used and widely useful:

- Framework data should be "data you can trust," and should be certified as complying with standards.
- Framework data should be the "best" data available. These data often are collected by local governments, utilities, regional and field offices of State and Federal agencies, and others.
- Along with these high-resolution data, the framework should contain consistently generalized, lower-resolution data to support regional and national applications. These data should be created from higher-resolution framework data where available.
- Users must be able to integrate framework data into their applications while preserving their existing investment in attribute and other information.
- Framework data should be accessible at the cost of dissemination, free from use criteria or constraints, and available in non-proprietary forms.

The framework will depend on many organizations contributing to its construction and maintenance:

- Rules for contributing to the framework, and the requirements placed on contributions, should be minimal and stable.
- Contributions will be from a large number of geographically distributed organizations, which have different missions and goals.

The framework should evolve with users' and contributors' changing requirements and capabilities.

Benefits
The success of the framework depends on both contributors and users recognizing its benefits. The framework will help a participant:

- gain customers for other data products and services by making data easier to use and by increasing the number of organizations that use geospatial data.
- reduce expenditures for data collection and integration by avoiding the costs of redundant activities.
- focus on its primary business by ensuring the availability of reliable information.
- simplify and speed the development of applications.
- benefit more quickly and easily from data gathered by others.
- gain recognition of its programs.

Technical Characteristics
The framework:

- is composed of geographically distributed data holdings that are connected through information networks and digital media and are accessible using a common query mechanism.
- supports transactional updates that minimize impacts on producers and users.
- employs feature-based encoding of geographic phenomena and the use of attributes for non-locational information. Locational (coordinate) information is encoded in associated spatial objects. Vector-based spatial objects will conform to topological rules.
- may provide multiple resolutions of data for any given location.
- uses permanent feature identifiers that serve to associate framework and users' attribute data, to identify data involved in transactions, and to link multiple representations of features.
- uses common means of referencing coordinate positions, based on nationally-recognized horizontal and vertical datums.

- retains past versions so that data are available for historical or process studies.

- preserves positions of contributed data. Edges of adjoining contributions will not be adjusted, although the disjoint lines will be associated through a common feature. Alignments in generalized data may be joined if the alignment errors can be resolved within the error tolerances.

- integrates data across themes where possible.

Information Content
Framework data include:

- *Geodetic Control* — geodetic control stations, and their names, unique identifiers, and locations and orthometric and ellipsoid heights with accuracy information.

- *Digital Orthoimagery* — georeferenced image prepared from a perspective photograph or other remotely-sensed data in which displacements of images due to sensor orientation and terrain relief have been removed. Framework data may range in resolution from sub-meter to tens of meters.

- *Elevation Data* — for land surfaces, an elevation matrix; for depths, soundings and gridded bottom models. Shorelines will have the attribute of shoreline type (or tidal reference).

- *Transportation* — roads, trails, railroads, waterways, airports, ports, bridges, and tunnels. Attributes include a permanent feature identifier and name. Where available, linear referencing systems will be used as the identifier. In addition, roads will have the attributes of functional class and street address range. Trails and railroads will have the attribute of type.

- *Hydrography* — reaches, based on the approach of the U.S. Environmental Protection Agency's Reach File Version 3.0 (RF3). Reaches will have the attributes of reach code, name, reach type (eg. stream or lake), and spatial representation.

- *Governmental Units* — Nation, States, counties, incorporated places and consolidated cities, functioning and legal minor civil divisions, American Indian Reservations and Trustlands, and Alaska Native Regional Corporations, each with the attribute of name and applicable Federal Information Processing Standard (FIPS) code. Boundaries will include information about associated features and the type of association.

- *Cadastral* — cadastral reference systems (such as the Public Land Survey System), large publicly-administered parcels (e.g. military reservations or state parks), and survey corners and boundaries. Each will have a name or other common identifier and quality information.

Institutional Roles
The framework will be operated and maintained by a group of participants that agree to provide digital geospatial data that meet content, quality, policy, and procedural criteria. Roles include:

- *Data Producer* — provides the contributions on which the framework is developed. Produces or maintains framework data to standards (including attributes, metadata, and quality testing). Some producers may provide framework data under contract.

- *Area Integrator* — ensures that framework data for a geographic area are coordinated. Implements standards and certification policies and procedures, coordinates maintenance activities within the theme or among themes, and processes updates. Areas of responsibility could cover a State, a group of States, or part of a State.

- *Data Distributor* — provides data to users. Designated distributors will be charged with holding the official distribution copy.

- *Theme Manager* — provides continuing operational support nationwide. Delegates production responsibilities, coordinates integrators, serves as a producer and integrator "of last resort," generates lower-resolution data, develops certification policies and procedures, develops and recommends standards, and ensures a safe archive.

- *Theme Expert* — provides the technical perspective of the community knowledgeable about a theme of data. It is likely that this community will generate the bulk of the data for a theme.

- *Policy Coordinator* — provides overall guidance to the otherwise distributed roles for the framework. This role includes approving standards; identifying resource needs and working with others to obtain resources; designating theme managers; resolving issues that develop among themes; initiating pilot studies, concepts, and implementation strategies; and encouraging partnerships.

Next Steps
Work is underway to develop an implementation strategy. The implementation will be phased, with the goal to have an initial implementation of a national geospatial data framework by the year 2000.

Public comment is sought to help refine the concept. Framework sessions are planned for the URISA and other conferences.

To obtain additional details about the framework or to provide comments, please contact the FGDC Secretariat by mail at the U.S. Geological Survey, 590 National Center, Reston, Virginia 22092; by telephone at (703) 648-5514; by facsimile at (703) 648-5755; or by Internet at gdc@usgs.gov. Additional information about the framework also is available by anonymous FTP from ftp://fgdc.er.usgs.gov/gdc

The National Spatial Data Infrastructure (NSDI)

Ask 20 people to define the National Spatial Data Infrastructure (NSDI), and you are likely to get 20 definitions that vary in scope, application, responsibility, and format. Most would agree, however, that the NSDI consists of organizations and individuals who generate or use geospatial data, of the technologies that facilitate use and transfer of geospatial data, and of the actual data. The reasons for the NSDI are to provide a means to search for, find, access, and cooperatively produce and use geospatial data.

Communicate

On a basic level the infrastructure consists of individuals who are interested in geospatial data: data users and producers. A critical first step in developing the infrastructure is establishing the ability to communicate and building links among individuals and organizations within the geospatial data community. The most technically sophisticated can communicate electronically using tools such as Internet or proprietary networks within agencies. Others can communicate by telephone, newsletters, or conferences. Regardless of the means, the key is that knowledge about data availability is proliferating because communications are improving.

How to participate

- While no one needs more meetings in their lives, talking to others is a vital first step to benefitting from the NSDI. Organize and participate in groups of geospatial data users and producers in your region. These groups, such as professional societies, user groups, and groups active in themes of data or issues of special interest, exist in many parts of the country. If you don't represent your interests, who will?
- Help to organize and support the development of statewide coordination groups. While not all issues are neatly organized by State, the States do provide an institutional framework that can help to solve problems.
- Subscribe and participate in list servers on the Internet that discuss geospatial data issues. These lists, such as GIS-L, MAPS-L, and NSDI-L, provide a wide range of views from across the world.

Use Common Procedures and Standards

A second step in developing the infrastructure recognizes that data sharing can be facilitated through the use of common procedures and standards. Metadata, or data about data, are critical first to determine that specific data exist, and second to understand the nature and quality of the data to determine whether they are useful in a specific application. Consistency in how, when, and where to document data will assist others in using the data. A metadata standard for consistency in documentation, the Content Standards for Digital Geospatial Metadata, was recently approved. If members of the geospatial data network can agree to use standards such as this or the Spatial Data Transfer Standard (SDTS) for data transfer, building another tier in the NSDI becomes possible. Everyone moves one step closer to finding and retrieving data.

A network-based clearinghouse for geospatial data is being developed to provide metadata and geospatial data to the community. Instead of centralizing all information in one place, the Internet is used to link all the sites where data are produced or maintained. With this approach, data producers can control and maintain information provided about their data. Users can access this network of information using the Internet and find what data exist, the quality and condition of the data, and the terms for obtaining them.

How to participate

- Begin to learn and use standards like the metadata standard and SDTS. Much of the information requested by the metadata standard is available during data production. Other standards, like the SDTS, are more comprehensive and challenging. Understanding the problems that these standards try to solve, and the way that they try to solve them, can help in understanding how to more effectively produce and use geospatial data.
- Investigate ways to provide metadata to the clearinghouse. Set up a clearinghouse node and provide metadata on the Internet. Or work with others to establish a site that provides the metadata on behalf of the group.
- Encourage vendors to provide the tools needed to use standards. Vendors need to hear from you about what's important.
- Before developing a new standard, see what's available. It's easier to work with existing standards than to start from scratch.
- Participate in the development of standards. Spend some time reviewing and trying out draft standards, and provide comments. Provide feedback on existing standards. Standards evolve with changing needs, and comments help to guide their development.

Build Partnerships

A third step in infrastructure development is establishing partnerships for transferring data or for developing common data bases. This step builds on previous actions of communications and agreement to use standards. For many individuals or agencies, agreeing to create and use common geospatial data sets is a major achievement. Partnerships to exchange (sell, trade, or share) data are common; partnerships to generate data are few.

One area in which representatives of local, State, and Federal agencies are working is the concept of framework data for the NSDI. While applications of digital geospatial data vary greatly, users have a recurring need for a few common types of data, such as roads, streams, terrain, boundaries, and orthoimagery. The framework will be a basic, consistent set of digital geospatial data and supporting services that will (1) provide a geospatial foundation to which an organization may add detail and attach attribute information; (2) provide a base on which an organization can accurately register and compile other themes of data; and (3) orient and link the results of an application to the landscape. Framework data will take advantage of data being collected by organizations throughout the geospatial data community, and its success depends on the willingness of organizations to participate.

How to participate

- Realize that the success of partnerships largely depends on you. Important factors include a spirit of cooperation, flexibility, equality, communication, and consensus on technical and policy issues.
- Participate in discussions about the framework. Consider the data that used applications, and think about what data could be contributed, what data are needed, and the advantages of participating in the framework.

Future Paths

It is unlikely that the NSDI ever will be one, agreed-upon set of geospatial data representations for the Nation (for example, one road network). The NSDI most likely will include a large collection of multiple representations of geography that meet our needs.

We and the data we collect are all components of the NSDI. Many users have come to realize the benefits of having more cohesiveness within our geospatial data community, of building partnerships, making agreements, and communicating what we know. We can all share the success of developing the NSDI.

Sources of Information

For information about the Federal Geographic Data Committee (FGDC), including the metadata standard, clearinghouse, and framework, please contact:

FGDC Secretariat
c/o U.S. Geological Survey
590 National Center
Reston, Virginia 22092;
telephone: (703) 648-5514;
facsimile: (703) 648-5755;
or Internet gdc@usgs.gov.

The FGDC maintains an anonymous FTP site at

ftp://fgdc.er.usgs.gov/gdc/

Users that have a World Wide Web (WWW) browser (such as Mosaic) can access the FGDC server at

ftp://fgdc.er.usgs.gov/gdc/html/fgdc.html

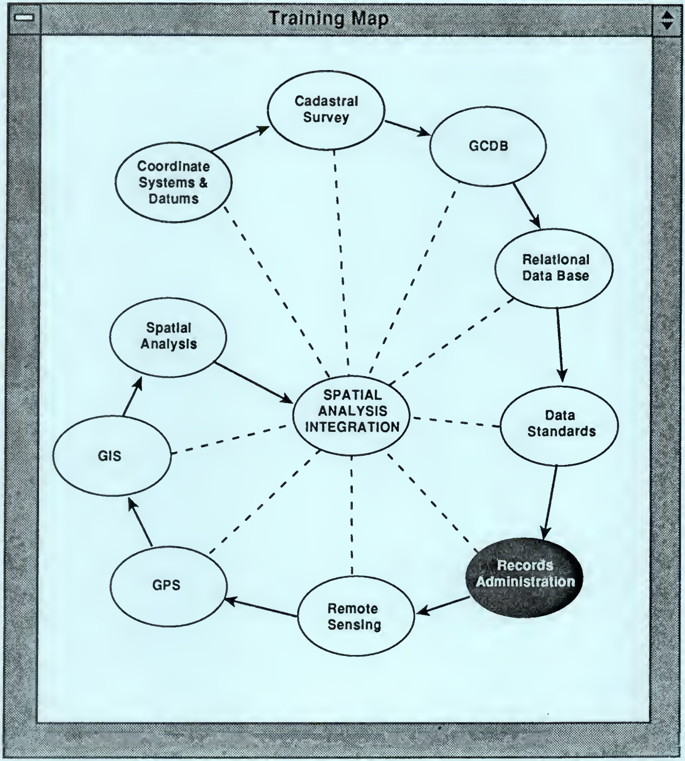
For information about the Spatial Data Transfer Standard, please contact:

SDTS Task Force
c/o U.S. Geological Survey
526 National Center
Reston, Virginia 22092;
facsimile (703) 648-4270; or
Internet sdts@usgs.gov.

The task force maintains an anonymous FTP site at:

ftp://sdts.er.usgs.gov/sdts/

GEO - DATA COLLECTION & USE
(for Ecosystem Based Management)



Course No. 1730-11

RECORDS ADMINISTRATION

LESSON OBJECTIVE

The trainee will better understand how Official Agency Record Documentation (OARD) affects data sharing and maintainence by examing the following record procedures and action items.

☞ Records Access Categories

☞ Cost Recovery

☞ Official Agency Records Documentation

☞ Life Cycle Management

LIFE CYCLE MANAGEMENT

CREATION

- Official Agency Record Documentation

MAINTENANCE AND USE

- Management of electronic records
- Maintaining the integrity of records
- Categories of records
- Access to records
- Data Share

DISPOSITION

- BLM Records Schedules
- Transferring records to Federal Records Centers
- Destruction of temporary records

OFFICIAL AGENCY RECORD DOCUMENTATION

WHAT IS AN OFFICIAL AGENCY RECORD?

Any automated Bureau record that has met all the required legal and administrative standards prior to it's use for decision making can be designated as an Official Agency Record.

The goal we need to strive for is that each new automated system be designated as an Official Agency Record.

Electronic records pose a legality issue related to admissibility in a court of law.

The two federal laws that are most often cited when determining the use of both film and digital reproduction in a court of law are the Federal Rules of Evidence and the Uniform Rules of Evidence.

- **These statutes allow the admissibility of computer processed information - if - this information has been kept in the regular course of business and if it was the regular practice of the business.**

- **Courts are not so much concerned with on which medium documents are stored as with whether the information being submitted as evidence is trustworthy, accurate, and reliable.**

RECORDS ADMINISTRATION

Maintaining accountability requires establishing a formal control system within the document management procedure.

The Bureau has developed Official Agency Documentation (OARD) Procedures to be used when developing any new system of records.

The benefits of Official Agency Record Documentation are:

- To designate records as official for external access and internal use.
- To ensure legal admissibility in courts

A key point to remember ---if your data has not been through the OARD process it can not be used in agency decision making and should not be used internally --day to day use in your job.

Completion of the OARD is a joint effort between the Data Steward and the Records and Data Administrators.

The Bureau has initiated the OARD documentation on three bureauwide systems LLD, STATUS, and GCDB.

Check with your State Records Administrator on the status Official Agency Record Documentation of systems in your state.

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Return to Central Files

ARIZONA STATE OFFICE
BUREAU OF LAND MGMT

JUN 3 '93

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UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
WASHINGTON, D.C. 20240

May 28, 1993

In Reply Refer To:
1270/1283 (873)

Instruction Memorandum No. 93-245
Expires 9/30/94

To: SD's, and SCD

From: Director

Subject: Legal Land Description, Status and Geographic Coordinate Data Base Official Agency Record Documentation

This Instruction Memorandum transmits the Bureau of Land Management's (BLM's) official agency record documentation and supplemental requirements for Legal Land Description (LLD), Status, and Geographic Coordinate Data Base (GCDB).

Records Administration policy requires this documentation to support the BLM's designation of these data as official agency records before use of the data in BLM decisionmaking and to ensure admissibility in the courts. The official agency record designation allows these records to move from Records Category 3 (non-public) to Records Category 2 (discretionary) on a State-by-State and data file by data file basis. This action will:

- o Support the integrity of the records;
- o Fulfill administrative and statutory requirements;
- o Facilitate in-house use of this data for decisionmaking;
- o Allow the BLM flexibility in accomplishing critical work assignments;
- o Enable further enhancement of the data; and
- o Reduce the Data Sharing Agreement and Freedom of Information Act workload.

Attachment 1 is the approved framework that allows States to designate these records as official agency records by completing the supplemental action item documentation in attachment 2. Sections for these data files should be added to the State Data Quality Assurance Plan. This documentation must be completed by each State, and signed by the State Director in order to complete the official agency record approval process and in order to move these records from Category 2 to Category 3. [illegible]

Questions should be directed to Dorothy Chambers, Bureau Records Administrator (WO-873) at (202) 653-6105.

Carson W. Culp, Jr.
Acting Deputy Director

2 Attachments:
1 - Official Agency Record Designation and Supporting Documentation (9pp)
2 - Agency Record Action Items and Approval Documentation (18pp)

Official Agency Record Designation and Supporting Documentation
for
Legal Land Description (LLD), Status, and Geographic Coordinate Data Base (GCDB)

A. Introduction

This documentation must accompany the Official Agency Record Action Items and Approval Documentation (see Attachment 2).

1. Background

The Bureau of Land Management (BLM) policy established in the BLM Manual 1270, Records Administration, and the BLM Manual 1270-1, Electronic Records Administration, requires proper documentation of automated data to attain "official agency record" status. This supports the integrity of the records; fulfills administrative and statutory requirements; and authorizes use of the data for BLM decision making. Instruction Memorandum (IM) No. 92-340, Records Transition Interim Guidance, provides the framework for documentation.

This document, combined with State Data Quality Assurance Plans, provides the procedures required for designating LLD, Status, and GCDB data, herein after referred to as "these data," as "official agency records" to be used for the BLM decision-making applications prior to integration into the Automated Land and Mineral Record System (ALMRS)/Modernization system. As compatible components of ALMRS/Modernization, the procedures for these three data files are documented together.

The use of these data provides the BLM flexibility in accomplishing critical work assignments.

- **Criteria for Use of These Data**

■Data quality meets or exceeds ALMRS minimum Acceptable Quality Level (AQL)

To be considered for "official agency record" status, these data must meet the minimum Acceptable Quality Level (AQL) that has been established for use of these data in ALMRS. Minimum AQL's are documented in BLM Manual Section 1283 - Data Administration. For these data, the minimum AQL's are:

LLD	99%
Status	98%
GCDB	98%.

Procedures for measuring and certifying data quality are documented in the State Data QA Plan.

■Data quality does not meet ALMRS AQL or is not measured

There are two ways that States may use these data for **non-ALMRS** automation projects for specific geographic areas:

1. A project needs these data **at or above** the ALMRS AQL. The project commits to validating the data before use and providing improved data back to the official record copy of the electronic data file. The data validation procedures used are appended to the appropriate section of the State Data QA Plan. The certified data are used for the specific application.

2. A project does not need these data **at or above** the ALMRS minimum AQL. The AQL's for **non-ALMRS** use of these data have not been established on a Bureauwide basis. Program data stewards determine the AQL that is acceptable for a specific application. The data quality is measured and documented in the State Data QA Plan. A risk analysis of using the data at the specified quality level should be documented in the project file.

2. Assumptions and Constraints

a. **Operational life** - These data are components of ALMRS. Their collection, maintenance, and validation are requirements of the ALMRS Data Collection/Validation and GCDB Projects.

b. Designation of the data in these stand-alone data files as "official agency records" will not have the effect of replacing any existing records.

3. Description of Records

a. Existing Records

Not applicable.

b. Project Records

Project records include handbooks, user guides, and correspondence between the Service Center (SC) and the SO's. A numerical file of requests for technical direction is maintained by the SC and the States that document technical direction provided to the Title Status and GCDB contractors.

c. Automated Records

Legal Land Description (LLD) is an automated alpha numeric file/inventory of survey information collected from the Master Title Plats (MTP's), and cadastral survey plats and field notes. The LLD uses the land description conventions of the Public Land Survey System (PLSS): consisting of the meridian, township, range, section, survey type, survey number, survey number suffix (aliquot part, lot, tract, metes and bounds, etc.), nominal location, and acreage depicted on official survey plats. The LLD also contains geo-political data about each parcel of land: County, Congressional District, the BLM District, the BLM Resource Area, and Surface Management Agency.

Status is an alpha numeric file containing Federal land and mineral ownership information, withdrawals, and classifications. This file contains title information concerning transfer of any or all rights to or from the U.S. and any restrictions of U.S. rights.

The GCDB consists of geographic coordinates for corners of the PLSS. It also includes attribute data such as reliability, computational parameters, and corner classification. The GCDB has been compiled from the BLM's Cadastral Survey plats and field notes, Geological Survey topographic maps, and private, State, and other agency survey data. It is a compilation of the latest survey data available in the public sector. Because of this, the GCDB reliability ranges from areas of very high reliability to areas of extreme uncertainty. Overall, it is the best automated collection of PLSS coordinate data available.

B. Administrative/Statutory Requirements

1. Access

The LLD, Status, and GCDB data may be classified as Category 2 discretionary electronic records (Washington Office (WO) IM No. 93-40 and Change 1, Policy for Managing External Access to BLM Records) **WHEN THEY MEET THE BLM-ESTABLISHED ACCEPTABLE QUALITY LEVELS** (LLD - 99 percent, Status - 98 percent, and GCDB - 98 percent; the BLM Manual 1283, Data Administration). These data are not sensitive information that require Freedom of Information Act (FOIA) or Privacy Act review. All copies/outputs from these data files may be purchased at cost upon request by the public. The BLM cost recovery policy will apply. Ad-hoc queries may be performed by the BLM employees to aid in responding to public requests.

2. Vital Records Status

The data are Vital Records due to the costs associated with recollection for integration into ALMRS/Modernization (see the BLM Manual 1273, Vital Records). These data are backed up off-site for maximum security.

3. Public Room Impacts

There are limited research capabilities of LLD and Status to answer public room requests (e.g. mineral surveys, homestead entry surveys, patentee name, patent number, lode name, etcetera). An unestimated workload will be generated affecting Automated Data Processing (ADP) and public room personnel for copies of these data by State, local, and other Federal agencies, and title companies, energy corporations, and other members of the public.

4. Data Sharing/Exchange

There is a high potential for exchanging/sharing these data with private entities, Federal and State Governments. Data exchange agreements should be completed according to procedures contained in WO IM No. 93-40 and Change 1, Policy for Managing External Access to the BLM Records (proposed BLM Manual 1278, Confidentiality and Access to the BLM Information).

5. Cost Recovery

Current BLM cost recovery rates are applied to records from these data files.

6. Records Inventory and Disposition

The SC and SO records inventory and disposition schedules will be referenced for existing input records, project records, and automated outputs.

7. Records Maintenance

The BLM Manual 1270-1, Electronic Records Administration, outlines the BLM policy relating to data file maintenance. Daily backup tapes are made of these data files along with weekly saves and monthly off-site tapes. Hardware and software logs are maintained by the ADP System Managers.

C. Data Integrity

1. Data Stewards

State Data Stewards, with procedural guidance from State Data and Records Administrators, assure compliance with QA procedures and the official agency record action items. State Data Stewards assure complete collection and entry of these data to the BLM's acceptable quality levels.

2. **Audit Trail**

These are dynamic data files which are updated daily. All input/source documents are maintained in accordance with the General Records Schedule (GRS) and the BLM Combined Disposition Schedules. Printouts of these data may be produced for sale to external requesters. Tapes of these data require typed labels with the date of creation and the appropriate disclaimer (WO IM No. 93-162, Disclaimer Policy for External Release of Electronic Records).

3. **System Security**

Access to the data files is limited to those people who need access and are approved by their supervisors and the data stewards. The computers that the data files reside on are in controlled access rooms. Personal computers containing this data have password and locked keyboard security. Regular backups are made of the data and stored offsite. When employees are no longer employed by the office, access permissions are deleted for those employees. Individual user identifications, once established, grant or limit access to only the level needed to perform the employee's work, i.e., read or write permissions. State Continuity of Operation Plans (COOP's) contain procedures to be followed for disaster recovery. (See the BLM Manual 1264, Security; and the Computer Security Act of 1987.)

4. **Update Method**

Data collection procedures are included in the Bureauwide Application 2002 Data Element Dictionary, the LLD Handbook (1985) which includes data entry screens, the ALMRS Status Coding Handbook (Revised 5/16/91), and WO IM No. 91-3, Change 1, and Change 2, ALMRS Status Collection Data Standards for Withdrawal Actions. Update procedures for GCDB data are currently under development.

5. **Data Quality Assurance**

A statistical random sampling of LLD and Status (see Match/Merge User Guide for Maintenance of LLD and Status in Master

Files) is conducted by Data Stewards and certified by State Data Administrators for determining the quality level of these data. The GCDB QA procedures are being developed. Once these data meet the AQL, random sampling must be completed at least annually to verify that these data are being maintained at the AQL of 99 percent, 98 percent, and 98 percent, respectively.

6. Training

Training ranging from informal briefings, prepared handbooks, and user guides to formal presentations was provided to the BLM and contractor staffs. Training will continue as required. Training will be provided by the Data Stewards to the Public Room staff on how to query these data for responses to public requests.

D. Software Reliability

See State-specific Official Agency Record Action Items and Approval Documentation.

E. Hardware Reliability

See State-specific Official Agency Record Action Items and Approval Documentation.

F. References

-BLM Manual 1261 Automation/Information Resources Management/Modernization and Life Cycle Management
-BLM Manual 1270 - Records Administration
-BLM Manual 1270-1 - Electronic Records Administration
-WO Instruction Memorandum No. 92-340 - Records Transition Interim Guidance
-BLM Manual 1283 - Data Administration
-BLM Manual 1273 - Vital Records
-BLM Manual 1274 - Serialized Case File System, Revised 9/13/83
-BLM Manual 1275 - Land Status Records, Revised 4/13/84 and supplemental state-issued Instruction Memorandums
-Manual of Surveying Instructions, 1973
-Status Contracts
-ALMRS Status Coding Handbook, Revised 5/16/91 - used for abstracting status for automation
-User's Guide for V Forms--Legal Land Description, Revised 7/1/1985

- WO IM 93-160 - Annual Review of Cost Recovery Charging Rates
- WO Information Bulletin (IB) No. 92-204 - Cost Recovery Charging Rates of Automated Data Processing Requests
- WO IM No. 93-40 and Change 1 - Policy for Managing External Access to BLM Records
- WO IM No. 93-162 - Disclaimer Policy for External Release of Electronic Records
- ALMRS Data Collection/Validation Project Charter
- Match/Merge Handbook, Revised 2/2/93
- Match/Merge User Guide for Maintenance of LLD and Status in Master Files, 2/1/93
- Withdrawals Handbook, 5/16/91 - Standards for Withdrawal Data Collection in Status
- Data Element Dictionary (DED) (Application 2002)
- Edit 8 Handbook - SC DPS8000 Modified Text Editor used for update and maintenance of database
- Records Transition Project Charter
- BLM Public Land Survey System/Geographic Coordinate Data Base (PLSS/GCDB) Data Collection Project Charter, 7/29/91
- GCDB--Methods and Procedures, 2/1/89 (4 volumes)
- GCDB Quality Assurance Plan, January, 1991
- GCDB Measurement Management (GMM) System Addendum to Geographic Coordinate Data Base Quality Assurance Plan Draft, February, 1992
- GCDB Contract YA-652-CT9-440016, September, 1989 (lower 48 states, as appropriate)
- GCDB Solicitation N-G52-R2-0003, September, 1992 (lower 48 states, as appropriate)
- GCDB Contract YA-652-CT9-440017, September, 1989 (Alaska)
- GCDB Contract N-652-C3-0001, April, 1993

G. Official Agency Record Action Items and Approval Documentation

This document outlines the actions to be accomplished, serves as a record of completion, and certifies the data as an Official Agency Record.

Recommend for Approval:

Dorothy A. Chambers
Bureau Records Administrator

Renee L. Duval
Bureau Data Administrator

Concurrence:

Terence F. Call
Chief, Division of
Information Resources Management

Tom Allen
Assistant Director, Management Services

Assistant Director,
Lands and Renewable Resources

Hillary A. Oden
Assistant Director,
Energy and Mineral Resources

Approved:

Director, Bureau of Land Management

Official Agency Record Action Items and Approval Documentation
for
Legal Land Description (LLD)
Arizona

OFFICIAL RECORDS REQUIREMENTS	DOCUMENT, DECISION OR REFERENCE	COMPLETED BY:	DATE COMPLETED
ADMINISTRATIVE/ STATUTORY			
Access	These data are designated Category 2 - Discretionary Automated Records (WO IM No. 93-40 & Change 1) **WHEN IT MEETS BUREAU-ESTABLISHED AQL'S** (LLD - 99%); (BLM Manual 1283) at the discretion of the State Director.	Data Steward, Records Administrator, Data Administrator, and State Director	07/07/93 Arizona AQL is 99.9%
Vital Records Status	Add these data to the State's Vital Records Inventory (BLM Manual 1273).	State Data Steward & Records Manager	07/07/93
Public Room Impacts	Notice of Availability of these data must be posted in the public room when this data is moved to Category 2 at the SO.	State Records Administrator	07/07/93
Data Sharing/Exchange	Data Sharing Agreements (IM No. 93-40 & Change 1).	State Data Steward, Data and Records Administrators	See specific Data Sharing Agreements.
Cost Recovery	Current Cost Recovery applies to these Category 2 automated records.	Public Room Personnel and State Records Administrators	Rates reviewed annually.
Records Maintenance	Daily backup tapes along with weekly saves and monthly off-site tapes. Hardware and software logs are maintained. (See BLM Manual 1270-1.)	State Data Steward	See ADP logs.
Disposition	These data are transitional components of ALMRS. They will be integrated into ALMRS/Modernization. The designation of the data in this stand-alone data file as "official agency records" will not have the effect of replacing any existing records.	N/A	N/A
Records Inventory	Add these data to the state records inventory and disposition schedule.	State Data Stewards and State Records Manager	See State records inventory and disposition schedule.

Official Agency Record Action Items and Approval Documentation
for
Legal Land Description (LLD) (Cont'd.)

OFFICIAL RECORD REQUIREMENT	DOCUMENT, DECISION OR REFERENCE	COMPLETED BY:	DATE COMPLETED
DATA INTEGRITY			
Data Stewards	Data Stewards designated and identified in the State Data Quality Assurance Plan.	State Data Administrator, State Director	See State Data QA Plan.
Audit Trail	Daily backup tapes, weekly saves, and monthly off-site tape storage. Backup/archived tapes of these data will require typed labels with the date of creation and appropriate disclaimer (WO IM No. 93-162). See LLD Handbook (includes Data Entry Screens and instructions).	State Data Steward and ADP System Manager	See ADP logs and project files.
System Security	Access is controlled through password procedures and guidance contained in BLM Manual 1264 and the Computer Security Act of 1987.	State Data Stewards, ADP Systems Manager and ADP Security Officer	See ADP logs.
Update Method	See LLD Handbook.	State Data Steward	See project files.
Data Quality Assurance	AQL for specific projects to be determined prior to using these data if Bureau-established AQL is not met. Random sampling is on-going.	State Data Steward and State Data Administrator	See State Data QA Plan.
Training	Training ranging from informal briefings, prepared handbooks, and user guides to formal presentations was provided to BLM and contractor staffs. Training will continue as required. Training will be provided by the Data Stewards to the Public Room staff on how to query these data for responses to the public.	State Data Stewards	See project files.

Official Agency Record Action Items and Approval Documentation for Legal Land Description (LLD) (Cont.'d)

OFFICIAL RECORD REQUIREMENT	DOCUMENT, DECISION OR REFERENCE	COMPLETED BY:	DATE COMPLETED
SOFTWARE RELIABILITY			
Installation Version	See SC and State ADP logs.	ADP System Managers	See SC and State ADP logs.
Installation Procedures	See SC and State ADP logs.	ADP System Managers	See SC and State ADP logs.
Testing New Versions	See SC and State ADP logs.	Data Stewards and ADP System Managers	See SC and State ADP logs.
Modification/Revision	See SC and State ADP logs.	Data Stewards, System Managers	See SC and State ADP logs.
HARDWARE RELIABILITY			
Personal Computers	If applicable, logs will be maintained to document computer functions and maintenance	State Data Steward	See State ADP logs.
Mini or Mainframe Computer	Logs are maintained to document computer functions and maintenance. LLD is on the SC Honeywell DPS8000 and the SO Honeywell DPS6+.	Data Stewards, ADP System Managers	See State ADP logs.

ACCESS PROCEDURES

It is the Bureau's policy to release as much information as possible, but at the same time recognizing that some information needs to be protected from release.

The Freedom of Information Act (FOIA) is the base Federal legislation which determines access to all Federal information.

The FOIA requires agencies to make certain information available to the public for free inspection, such as Manuals, policy statements and final adjudicative decisions.

The FOIA also requires Federal agencies to protect certain information from public disclosure such as privileged/confidential information, commercial business information, privacy or geological information.

To assist in responding to requests for records BLM has listed all Bureau records into three categories: Public, Non-public, and Discretionary records or Information Service Records. -- These lists can be found in WO IM-93-40.

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
WASHINGTON, D.C. 20240

May 4, 1994

In Reply
Refer To:
1278 (872)
Affects BLM IM No. 93-40

EMS TRANSMISSION 5/6/94
Instruction Memorandum No. 94-187
Expires 9/30/95

To: AD's, SD's and SCD
Attn: Records Administrators and Freedom of Information Act Officers

From: Director

Subject: Records Access Categories DD: 5/31/94

On October 28, 1992, Instruction Memorandum (IM) 93-40 was transmitted addressing policy for managing external access to the Bureau of Land Management (BLM) information. Based on records administration statutes and for the purpose of cost recovery, all BLM information is reviewed and segregated into one of three records categories as follows:

- **Public - Category 1** (traditionally available - manual or electronic records and outputs);
- **Discretionary - Category 2** (nontraditional-electronic records and outputs determined releasable to the public); and
- **Non-Public - Category 3** (records not traditionally available to the public for administrative or statutory reasons).

Appendix 5 of IM 93-40 contains the current category listing of BLM records. We are preparing to update the category listing and request that your offices review the attached list of records categories, and provide the Division of Information Resources Management, Branch of Information Access Policy and Coordination (WO-872), with your suggestions for any deletions or additions which you feel are necessary using the guidelines as provided in Manual Section 1278.1, .13, and .14A and B.

Please provide suggestions with a short justification by May 31, 1994. You may contact Marilyn Legnini in WO-872, concerning questions and your recommendations at (202) 452-5013, or FAX at (202) 452-5002.

Signed
Terrence F. Call
Chief, Division of Information
Resources Management

Authenticated
Dawn Slaughter
Directives,WO873

1 Attachment
1 - Existing Bureau of Land Management Records Access Categories Lists (11 pp)

DEPARTMENT OF THE INTERIOR

BUREAU OF LAND MANAGEMENT

RECORDS ACCESS CATEGORIES LISTS

CATEGORY 1: PUBLIC INFORMATION

CATEGORY 2: INFORMATION SERVICE/DISCRETIONARY ELECTRONIC RECORDS

CATEGORY 3: NON-PUBLIC RECORDS

Date 10/20/93

Category 1 -- PUBLIC INFORMATION

Category 1 records include information which Federal agencies are required to make available to the public such as rules and procedures (BLM Manuals, Instruction Memorandums which affect the public etc.), final adjudicative decisions and policy statements. Other public land statutes and regulations specifically require BLM to also provide free public inspection to certain public land records such as cadastral survey plats, field notes and status records. Many of these public records are contained in case files. Those records marked with an asterisk (*) are case files which may on occasion, contain some non-public (Category 3) information concerning ongoing negotiations, financial information, business information, personal, privacy information, investigations, internal memos, drafts, and working documents, proprietary, geological and geophysical information relating to wells, or other sensitive information. This information, if it exists, should be segregated within the case file and removed from the file before providing access to the public. Requests for non-public information maintained in case files must be made under the Freedom of Information Act.

* Acquisition Files, including easements
Advisory Committee meeting and membership records
* BLM Manuals, Handbooks and Instruction Memoranda that affect members of the public
Bureau Employee Biography File PA OS-65
Cadastral Survey Field Notes, approved (including Mineral Survey Field Notes)
* Cadastral Survey Group Files (includes Survey Protests, Appeals and Contests
Cadastral Survey Plats, approved (including Mineral Survey Plats)
Cadastral Survey Requests
* Competitive Sale Mineral Use Records
* Contest Files
Control Document Index
Corner Recovery Cards (Found Section Corner Cards)
* Cultural Resource permits
Directives Digest/Index
* Exchange Files
Federal Register Notices
Federal Register Published Proposed Legislation and Regulation Files
Fire Records
* Grazing Allotment Files
* Grazing Use Files
Hazardous Material Site Administrative Record
Historical Indexes

Category 1 -- PUBLIC INFORMATION (cont'd)

Indexes and Finding Aids to public records
Information Collection Budget Records
Information Resource Management Plans (IRMP)
* Land Use Lease and Permit Case Files
* Land Withdrawal Case Files
* Land and Mineral Classification Files
Manual (card file) Case File Indexes
Master Title Plats
Mineral Surveyor Appointment List
* Mineral Use Lease and Permit Case Files
* Mineral and Vegetable Material Sales
Mining Claim Recordation Files and Indexes
* Mining Claim Validity Files
Mining District Connection Sheets
* Mining Notices and Plan of Operations Files
* Onshore Operational Case Files (APD's, unit agreements, communitization agreements, individual well records)
Patent Books and Clear Lists
Payment-in-Lieu-of-Taxes Records
Press Releases
Privacy Act Notices
* Project Development and Maintenance Records
Protraction Diagrams
* Public Land Patent Files
Public Land Statistics
Public Publications
Public Released Photos and Audiovisual Records
Public Released Training Manuals (e.g., Fire Suppression Training)
Published Draft and Final Resource Management Plans (including all types of resource and activity plans and public participation)
Published Draft and Final Environmental Statements
(including environmental assessments)
Published Maps
* Range Improvements
* Reciprocal Use and License Agreement Case Files
* Resource Management Planning Map Overlays (Mylar, various scales)
* Rights-of-Way
Segregation Diagrams
Serial Register Books and Log
* Short-term Leases and Permits
* Studies, Inventories, Reports, statistics on land management and resource use

Category 1 -- **PUBLIC INFORMATION** (cont'd)

Table of Organization Chart (current organization)
* Timber Sale Contracts
Tract Books
Unannotated Aerial Photography
* Unit Resource Analysis (includes map overlays), Management Framework Plans
Use Plats
Visitor Registers
Waterpower Project and Classification Files
* Wild Horse and Burro Adoption and Title Files
* Wild Horse and Burro Health Records
* Wilderness Area Case Files
Wilderness Study Area Files

The only automated systems currently designated available to the public on-line for free public inspection are:

Automated Systems

Case Recordation

ORCA

Alaska ALMRS

Mining Claims Recordation
(including on-line reports)

The following automated system hard copy OUTPUTS are designated public and are available for free inspection and paper printouts of reports may be purchased:

Automated System Hard Copy Outputs

Proprietor index from Case Recordation/ORCA (ALMRS)
(alphabetical hard copy printout in public room)

Data Element Dictionary for Case Recordation, ORCA, Alaska ALMRS and Mining Claims Recordation (hard copy printout in public room)

Category 2 -- INFORMATION SERVICE RECORDS/DISCRETIONARY ELECTRONIC RECORDS

Information Service records are those chosen Bureau records systems which are available in the public room for on-line viewing at a cost should a BLM office have the capability and desire to do so. These types of records have not traditionally been available in BLM public rooms. Placing these types of electronic records into this list **DOES NOT** categorize them as public records (i.e., BLM is not required by law to provide free access to the public). This category is discretionary in that BLM may choose to make these records publicly available. It is anticipated that on-line access to enhanced electronic record capabilities may be time consuming and costly to the Bureau; therefore making it desirable to recover costs providing this level of service to external users. User fees will be charged for access to the information system. Any hard copy outputs from these systems may be viewed upon request at cost and hard copy outputs may be purchased by the public.

Automated Lightning Detection Data (ALDS)
Batch reports from Case Recordation, ORCA, Alaska ALMRS and Mining Claims Recordation
Cadastral Survey Field Note Abstract Index System (request printout in T&R order from SO Cadastral Survey Chief or SC)
Digital Base Mapping Data
Directives Digest System
Eastern States Minerals
Eastern States Patent Index
Global Positioning System (Raw Data Collected by Community Base Stations)
Grazing Authorization and Billing System (GABS)
Non-Sensitive/Verified Corporate Automated Resources Data (As designated by State Director, SCD, D-NIFC)
Other Non-Sensitive/Verified Non-corporate Automated Data (As designated by State Director, SCD, D-NIFC)
Rangeland Improvement Project System (RIPS)
Remote Automated Weather Station Data (RAWS)

Category 2 -- DISCRETIONARY ELECTRONIC RECORDS (cont'd)

Terrain Data from Initial Attack Management System (IAMS)
Timber Sale Information System (Limited Subset of nonsensitive information)
Wild Horse and Burro Applicant Database
Wild Horse and Burro Disposal Database
Wildfire Reporting (FDR-AFFIRMS)

Category 3 -- NON-PUBLIC RECORDS

A Freedom of Information Act (FOIA) request must always be made in order for the private sector to obtain access to any **releasable portions** of non-public records (automated or manual records). Federal agencies are required to protect certain information from public disclosure such as privileged/confidential, commercial business information, privacy, geological and geophysical information relating to wells, ongoing investigatory materials or otherwise sensitive information. In addition, agencies have the discretion to protect certain predecisional materials that are part of a deliberative process such as internal memoranda, staff working materials, draft and working documents etc., if the agency can identify a harm to Government operations or personal privacy. All requested non-public records must be reviewed to determine if the records can be released or whether the materials are sensitive and therefore must be withheld under one or more of the nine specific exemptions provided by the FOIA. **Materials may only be withheld if one of the nine exemptions is applicable.**

Personnel Records

Administrative Training Manuals
Employee Awards
Employee Medical Records
Employment Application, Vacancy Files
Equal Employment Opportunity (EEO) Records
Examining and Certification Records
Financial Disclosure Reports
Grievance, Disciplinary, Adverse Action, Complaints and Appeals Files
Health Benefits and Compensation Claims
Health Records
Labor Management Relations Records
Merit Promotion Files
Occupational Injury and Illness Files
Official Personnel Files (OPF)
Performance Ratings
Personal Injury Files
Personnel Actions
Personnel Counseling Records
Position Classification Files
Security Clearance Files
Service Record Cards
Standards of Conduct, Ethics Files
Supervisory, Duplicate Personnel Files
Training Records
Volunteer Records

Category 3 -- **NON-PUBLIC RECORDS (cont'd)**

Payroll Records

- Individual Allotment Files
- Individual Earning and Service Cards
- Insurance Deductions Files
- Leave Application and Records
- Levy and Garnishment Files
- Payroll Files
- Retirement Files
- Savings Bonds Records
- Tax Files
- Time and Attendance Reports
- Wage Survey Files

Procurement and Property Records

- Bids and Proposals
- Contract Appeals Files
- Contractor's Payroll Files
- Excess, Surplus Personal and Real Property Reports
- Grant Files
- Personal Property Accountability Files
- Property Inventory Files
- Real Property Management Case Files
- Requisitions and Purchase Orders
- Routine Procurement Files
- Small and Disadvantaged Business Utilization Files
- Stores Records
- Tax Exemption Files

Budget Records

- Annual Work Plans
- Budget Estimates/Justifications
- Progress and other Budget Reports

Category 3 -- **NON-PUBLIC RECORDS** (cont'd)

Accountable Officers' Accounts Records

- Accounting Ledgers
- Administrative Claims Files
- Automated Financial Management System
- Collection Officer Designations
- Tort Claims Files

Travel and Transportation Records

- Freight Records
- Motor Vehicle Accident Files
- Motor Vehicle Operator Records
- Motor Vehicle Records
- Passenger/Travel Reimbursement Files

Other Administrative Records

- Administrative Site (structures, underground storage tanks, etc.) and (building survey, safety inspection and investigation files (includes radon tests, condition surveys, etc.)
- BLM Information Bulletins
- BLM Manuals, Handbooks Instruction Memoranda that **DO NOT** affect members of the public
- Cooperative Relations with other Entities (cooperative agreements, memorandum of understanding and interagency agreements)
- Delegation of Authority
- Emergency Planning Records
- Employee Identification Cards Records
- FOIA Requests and Appeals
- Forms Management Files
- General Correspondence
- Historical Organization Files
- Housing and Quarters Records
- Internal Committee Records
- Library requests, checkout, and control files
- Management By Objectives
- Management Improvement Records
- National Security Classified Records
- Postal and Mail Records

Printing Records
Privacy Act Requests and Appeals Records
Program Evaluation and Review Files
Reader Files
Records Disposition Files
Research and Development Records
Routine Information Request and Complaint Records
Schedules and Calendars
Security and Protection Files
Space and Maintenance Records
Telephone Use and Telephone Call-Detail Records

Investigative Files

Audit and Investigation Case Files
Law Enforcement Files
Patrol Logs
Trespass Case Files Pending and Closed

Other Natural Resource Program Records

Archeological & Paleontology site files
Aviation Use Files
Bond & Surety Case Files
Cave Records
Cadastral Survey Pocket Field Tablets
Drinking Water Quality Test Files
Environmental Reports, Management Plans still in progress prior to release for comments
Hazardous Materials (non-public privileged and confidential documents)
Land Appraisals
Litigation files
Mailing Lists
Mineral Reports (Refer to BLM Manual 3060, Appendix 2)
Mineral Surveyor Appointment Files
Non-public Photos and Audiovisual Records
Private Relief Claimants Legislative Files
Qualification Files
Registers, Tracking, Control, and Finding Aids to Internal Records
Sign Location Records

Category 3 -- NON-PUBLIC RECORDS (cont'd)

Threatened and Endangered Plants and Animals Locations
Township and Range Files
Unapproved Cadastral Survey Records (e.g., draft plats and field notes)
Unpublished Proposed Legislation and Regulation Files
Water Rights Permit Files
Working Papers

Information Resource Management (IRM) Records

ADP System Configuration Plans (Continuity of Operations Plan, Risk Analysis, etc.) and Security Records
ADP User Statistics, Charge Codes, and Password Files
Radio Frequency Assignments
Radio Logs

Automated Systems (includes all portions of automated systems (including software program) not located on the public list):

ADP Models and Simulations
Automated Financial Management System (on manual list)
Automated Inspection Records System (AIRS)
Automated Lease Management System (ALMS)
Bond and Surety Program
Data Element Dictionary
Digital Elevation Model (USGS) and Other Acquired Data
Geographic Coordinate Data Base
Geothermal Well Inventory
Global Positioning System Data (Manipulated data)
Hardware/Software Inventory Systems
Hydrologic Design Analysis
Initial Attack Management System (IAMS, but not including terrain data)
Inventory Data System
Legal Land Description Data
Master Name
Material Sales
Monthly Report of Operations

Category 3 -- NON-PUBLIC RECORDS (cont'd)

Nonsensitive/Unverified Automated Resources Data
Nonsensitive/Verified Automated Resources Data which have **NOT** been designated by the State Director, SCD, or D-NIFC as approved for Category 2
Other Nonsensitive/Verified Non-corporate Automated Data which have **NOT** been designated by the State Director, SCD, or D-NIFC as approved for Category 2 (includes acquired data from other sources)
Other Nonsensitive/Unverified Automated Data
Other Sensitive Unverified or Verified Automated Data
Potential Drainage Detection System
Seed Bid Analysis
Sensitive Unverified or Verified Automated Resources Data
Soil, Water, and Air Resources
Solid Leasable Minerals System (SLMS)
Special Recreation Permit Data Base
Status Collection Data
Timber Sale Information System
Water Data Management System
Waterpower System
Wildlife/Fisheries Information System (IHICS, WORDS, TEDS, RAIDS)

DATA SHARE/EXCHANGE

The Bureau's policy is to share and exchange records to the maximum extent possible in order to enhance operations and to provide the most effective access and use of Bureau information.

Most data sharing involves electronic records. Office of Management and Budget Circular A-130, requires agencies to share data to reduce costs to the public.

One Time or Ideas

One time requests for data or just sharing ideas does not require an agreement. Cost recovery applies to one time requests.

Data Information

On-going requests for Bureau information or cooperative efforts involving the sharing or exchange of information must be documented using the proper instrument

The purpose of a data share document is to address such areas as:

* What specific type of data will be exchanged, type of access, confidentiality of data (it is public data and can be released by the receiving agency or it is sensitive and can not be released)

* cost recovery issues

Data Sharing agreements clarify all the issues.

AGREEMENTS TO SHARE DATA

Types of agreements to share, exchange or purchase data include data sharing agreement and memoranda of understanding (MOU) (which cannot obligate appropriated funds); and assistance agreements, interagency agreements (IA); and contracts (which obligate appropriated funds). See the accompanying instruction memorandum for details about the information in this chart. Program offices should consult State Records and Data Administrators if assistance is necessary in determining the appropriate instrument. Consult procurement personnel if funds will be obligated.

	Instrument to Use and Manual Section					
Between BLM and:	**Data Share 1270**	**MOU 1786**	**Umbrella MOU**	**Assistance 1511**	**IA 1510**	**Contract 1510**
Any Party **To share or exchange data.** **No funds transferred or cost recovery used.**	**X**					
Any Party **When the purpose is broader than the data share.** **A basis for sub-agreements.** **No funds obligated.**		**X**				
State, Local Govt or Private Sector **To share or exchange data.** **BLM funds obligated.**				**X**[1]		
Federal Agency **To share or exchange data.** **BLM funds obligated.**					**X**	
State, Local Govt or Private Sector **To purchase data.**						**X**
Federal Agency **To purchase data.**					**X**[2]	
Any Party **To identify joint efforts with multiple parties.** **Requires additional data share documentation.**			**X**			

Attachment 2-1

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[1] See text for distinction between types of agreements (cooperative agreements and grants).

[2] Procurement of data from Federal agencies is occasionally done by other methods. Consult with your Procurement Analyst.

FORM AZ-1278-1
(MARCH 1993)

United States Department of the Interior
Bureau of Land Management
Arizona State Office

BLM Control Number ________

Data Acquisition Work Order

DATA ACQUISITION WORK ORDER (This section to be completed by the requestor. Additional space provided on reverse side.)

This constitutes an official request to acquire digital data or digital products created by Arizona Bureau of Land Management. Please identify the following digital data/system information.

Date: ____________

Requestor: ______________________________ Phone: ____________________

Address: ____

Requested Data/Products: ____

Data Format (Required): ____________ System: ______________________________

Blocking Factor: ____________________ Record Length: ______________________

ASCII: ______________ Binary: ______________ EBCDIC: ______________

……

DATA RELEASE (This section to be completed by BLM. Additional space provided on reverse side.)

Contents of Files: ____

Purpose of Generation: ____

Data Source and type: ________________________ Projection: ______________

Source Scale: ______________________ Capture Methodology: ______________

File Size __________ Reliability: __________________ Age of Source Data: __________

Accuracy of Digital Data: ____

Quality Control exercised in the compilation and capture process: ________________________

Data Element Definitions: ____

Quad identifier(s): ____

The above requested digital data or product created by Arizona Bureau of Land Management is hereby authorized for release.

Authorizing Official: ______________________________ Date: ________________
State Director

NOTE: No warranty is made by the Bureau of Land Management for use of the data for purposes not intended by BLM.

DATA ACQUISITION WORK ORDER **(continued)**

Requested Data ____

DATA RELEASE (continued)

Data Element Definitions:

Quad Identifiers:

Concurrence to release information identified:

____________________ Title ________________ Date ______
Data Steward/Program Lead

____________________ Title ________________ Date ______
Functional Area Chief/Manager

____________________ Title ________________ Date ______
Records Administrator

Data Release: Processing Status
(for System Administrator/Preparer)

	Initial	Date
Request received	______	______
Request processed	______	______
Product sent to requestor	______	______

COST RECOVERY

The Office of Management and Budget allows Federal Governments to charge for copies of records.

Access to BLM's public information is processed through our Public Rooms.

Access to BLM's electronic records is coordinated through the local Records Administrator and processed through our Public Rooms.

Access to BLM's non public records is coordinated through the local Freedom of Information Act Specialist.

Cost recovery rates are based upon a yearly analysis of what it costs to produce copies.

The government can not make a profit. Rates must reflect actual costs of reproduction.

Form 1221-2
(June 1969)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

MANUAL TRANSMITTAL SHEET

Release
1-1630

Date
6/23/94

Subject

1270-2 - COST RECOVERY

1. Explanation of Material Transmitted: This Manual Section describes the policy and authorities for implementing the BLM's cost recovery program. This Manual establishes the responsibilities, requirements, and standards used by BLM program offices to recover the costs associated with reproducing BLM information products or services from manual and automated records.

2. Reports Required: None.

3. Materials Superseded: IM 93-160 and IM 93-160, Change 1 are superseded by this release. No other directives are superseded.

REMOVE:	INSERT:
None	1270-2
	(Total: 25 Sheets)

Terence F. Call
Terrence F. Call
Assistant Director, Management Services
Acting

COST RECOVERY FEE SCHEDULE
EFFECTIVE JULY 1, 1994

PRODUCT/SERVICE	CURRENT RATE	DESCRIPTIONS	COMMENTS
STANDARD COPIES 8 1/2 x 11 and 8 1/2 x 14	$0.13/p	All paper copies, sized as shown, reproduced on a copy machine	Dept. Regulations 43 CFR Part 2, Appendix A
COLOR COPIER COPIES 8 1/2 x 11 and 8 1/2 x 14	$0.14/p	All paper copies, sized as shown, reproduced on a color copier	Rate to reviewed/ revised when BLM has more experience
NON-STANDARD SIZED COPIES (Any size larger than Standard Copies) (i.e., copies from 2510 or 2520)	$2.75/p	All paper copies, sized as shown, reproduced on a copy machine	
XEROX 2080 or EQUIVALENT COPIES	$4.20/p	Paper copies produced by a Xerox 2080 or equivalent machine	
FICHE COPIES (STANDARD/NON-STANDARD SIZED)	$1.10/p	All paper copies produced from micro-graphics reader/printer	
MICROFILM AND APERTURE CARD COPIES	$1.10/p	All paper copies produced from micro-graphics reader/printer	
FAX TRANSMISSIONS	$1.10/p + Research time + Any duplication fee	Documents sent via fax machine	
RESEARCH (for non-FOIA requests)	$8.40/hr. $0.00/under 1/4 hr.	Total time taken to locate a record when such time exceeds 15 minutes (Charge by 15 minute increments)	
SEARCH/REVIEW (for FOIA requests)	$18.60/hr. $ 9.20/hr.	Professional Clerical	Dept. Regulations 43 CFR Part 2, Appendix A
APERTURE CARD AND FICHE DUPLICATES	$0.50/fiche	Duplicate Celluloid	

MAPS (Published)	Various Prices	Maps produced by other agencies (Includes USGS) at their established prices;	
MAPS (Published)	$4.00/map	All other maps sold to Public	
O&G SALES LIST/	$10.00/ Over 250 pages $5.00/ Up to 250 pages	Paper copies of either Sales or Results list	Policy set forth by WO Fluid Mineral Leasing Division
O&G RESULTS LIST	Free for one page $5.00 for more than one page		Rate for more than one page are based on BLM's experience
PUBLICATIONS	$0.13/page for black & white copies	8 1/2 by 11 inch paper	For 50 or fewer copies contact the Printed Material Distribution Section SC-657B For 51 or more copies contact the Printing Officer SC-650
COMPUTER PRINTOUTS	$0.75/p	Hard copy of printouts produced in the Public Room on a printer from computer	Only for Case Recordation, ORCA, Mining Claim Recordation online reports (i.e., Serial Register/ Case Abstract Page)
ELECTROSTATIC PLOTTERS	$7.50/ paper product	28 by 32 inch paper copy	Minimum rates based on BLM experience
	$16.00/ mylar product	28 by 32 inch mylar copy	Subject to revision based on additional experience
PATENTS	$15.00/ per patent	Paper copy of Patent from bound volume at ESO only	
CERTIFICATION OF RECORD	$0.25/per certification		Set forth in 43 U.S.C. 1460

MAILING COSTS	No Charge	
SPECIAL MAILINGS	Postal Costs plus costs of customers requested packaging	Special Mailings requested by customer, e.g., express mail

Note for $3.00 minimum collections: Considering cost/benefits, fees may be waived for mail, telephone and fax request if the total charge is $3.00 or less. If the requestor has a declining deposit account the wavier would not apply. BLM District and Resource Area Offices may apply this discentionary fee wavier based on the volume of copy fees collected and the associated costs of processing these collections. For example, weekly deposits requiring the purchase of a money order for transmitting collections (BLM Manual 1372.73B1).

ADP REQUESTS: ELECTRONIC MEDIA

I. Rates for ADP Request from DPS 6+*

Raw Data; No formatting
$8.00 Admin Fee
+ $0.04 per Kilobyte
+ Research Time (see Research Time above)
+ Cost of Cassette, Tape, or Floppy
+ Postage

Data with Special Formatting
$8.00 Admin Fee
+ $0.08 per Kilobyte
+ Research Time (see Research Time above)
+ Cost of Cassette, Tape or Floppy
+ Postage

Hard Copy Printouts
$8.00 Admin Fee
+ $0.04 per kilobyte
+ Research Time (see Research Time above)
+ $2.00 per 15 pages
+ Cost of Paper
+ Postage

II. Rates for ADP Requests from Microcomputer

Microcomputer charges
$8.00 Admin Fee
+ $8.40 per hour for research time (Computer operator/actual processing time)
+ Cost of Floppy, Cassette, or CD-ROM)
+ Postage

***TABLE OF EQUIVALENTS**

Platform	Value	Bytes
DPS 6+	Sectors	256 Bytes
Prime	Record	2,048 Bytes
DPS 8000	Llink	1,280 Bytes
DPS 8000	Blink	76,800 Bytes

1,026 Bytes = 1 Kilobyte

III. Rates for DPS 8000**

This attachment conveys the billing rates for the DPS 8000 ADP requests. In FY-91, the Federal Systems Integration and Management Center (FEDSIM) completed a rate-setting analysis that reports ADP usage levels and costs of the Honeywell mainframe located in the State Offices. The DPS 8000 rates were calculated within the framework of the operational charging system and workload forecasts.

Product/Service		Billing Rate
Batch Processing		
	Processor time	$0.9657 /MINUTE
	Core memory	$0.0007 /K WORDS
	I/O channel time	$0.0585 /MINUTE
	Tape drives	$0.9722 /TAPE DRIVE
	Sysout: printer	$0.0586 /K LINES
	Sysout: punch	$2.8518 /K RECORDS
	Jobs	$0.0000 /JOBS*
Time Sharing		
	Connect time	$0.0417 /MINUTE
	Disk I/O	$0.0000 /REQUEST*
	Memory time	$0.0000 /BLK X MILLISEC/1K*
	Transmission	$0.0000 /CHARACTER*
	Sessions	$0.4728 /SESSION
DMIV-TP		
	Physical I/O	$0.0003 /PHYSICAL I/O
	Transactions	$0.0046 /TRANSACTION
	Elapsed time	$0.6858 /MINUTE
Communications		
	Disk storage, on-line	$0.0032 /LLINK USED/DAY
	Disk storage, off-line	$0.0000 /LLINK ALLOCATED*
	Tape library, on-site	$0.0000 /REEL*
	Tape library, off-site	$0.0000 /REEL*
Application Labor		
	Operation & maintenance	$22.6555 /HOUR
	Development	$46.6116 /HOUR

****TABLE OF EQUIVALENTS**

Platform	Value	Bytes
DPS 6+	Sectors	256 Bytes
Prime	Record	2,048 Bytes
DPS 8000	Llink	1,280 Bytes
DPS 8000	Blink	76,800 Bytes

1,026 Bytes = 1 Kilobyte

IV. Rates for ADP Requests from Prime Level A Computer*

* Refer to either Table of Equivalents identified by one or two *.

Electronic record processing charges for Public requests:

$0.0019 per CPU second (equivalent to 0.11 per CPU minute)
$0.0027 per I/O second (equivalent to 0.16 per I/O minute)
$1.00 per minute Connect time

Include the following rates:

Media Rates:

$0.08 per page for 8 1/2" X 11 inch printouts. See electrostatic plotter for rates.
Actual cost of floppy disc, cassette tape, CD-Rom, and other media used to disseminate electronic information.

Personnel Rates:

Personnel time required to process request (use research charges)
$8.00 Administrative Fee per request

Postage Rates: See mailing cost for rates

V. Rates for Eastern States (ES) General Land Office Optical System (GLO)

This attachment also conveys the billing rate for GLO Cost Recovery and Retrieval Equipment.

GLO RETRIEVAL COST/QUERY SESSION MINUTE	$2.00
Fax Server	$0.13/p
Paper (Same as Standard Copies)	$0.13/p

DISPOSITION OF RECORDS

Disposition refers to the actions taken regarding records when they are no longer needed for current Government business. As with all federal property, the disposition of records must be legally authorized.

Records Schedules are the key to a records disposition program.

Bureau's policy on email records:

- All Email messages that provide evidential and decision information of agency business will be preserved as an official agency record.
- EMail messages pertaining to routine information requests and notices of telephone calls and meetings, can be disposed of immediately. If there is a need to retain these messages, do not keep them for more than 3 months.

As new records or electronic records are created, we need to ensure that these records are scheduled for disposition. Without a disposition schedule, records are considered unscheduled and permanent records.

Contact your local Records Manager concerning disposition of records.

BLM RECORDS SCHEDULES

Schedule 17 - Cartographic, Aerial Photographic, Architectural, Engineering, and Cadastral Survey Records

Introduction

This schedule incorporates the cartographic, aerial photographic, architectural, and engineering records that are described in General Records Schedule 17 and adds records of a similar nature that are unique to BLM.

1. **Cartographic Records**. These are graphic representations at reduced scale of selected cultural and physical features of the surface of the earth and other planetary bodies. They include maps, charts, photomaps, atlases, cartograms, globes, and relief models. Related records are those records that form an integral part of the mapmaking process, such as field survey notes, geodetic controls, map history case files, source materials, indexes, and findings aids.

2. **Remote Sensing Records**. Remote sensing technology produces aerial photographs and other forms (e.g., digital) of visual images of the surface of the earth or other planetary bodies taken from airborne or spaceborne vehicles for the purpose of evaluation, measuring, or mapping the cultural and/or physical features of the landscape. Related tabular and graphic indexes necessary for the proper identification and retrieval of these records are also produced. Conventional aerial photographs taken from aircraft represent direct film images from cameras; other forms of imagery, such as those from satellites, sometimes require a conversion or alteration of sensor data from digital, electronic, or computerized forms to photographic or videographic images.

3. **Architectural and Engineering Records**. Official record copies of architectural and engineering records are filed in the official project file for the structure being designed and built on public lands. Other copies may be maintained for reference. Typical BLM projects include the design and construction of roads, trails, bridges, buildings, water catchments, fences, and other permanent or long-term structures. Other project files document the design and construction of temporary structures and resource improvements such as discing, chaining, burning, planting, or seeding of public lands.

4. **Cadastral Survey Records**. The survey records described in this schedule are the hard copy documentation for all types of land surveys (township surveys, dependent and independent surveys, supplemental surveys, agricultural surveys, homestead surveys, mineral surveys, etc.). A cadastral survey is an official survey that creates, marks, defines, retraces or reestablishes the boundaries and subdivisions of the public and federal interest lands. An official survey is one which has the field notes approved, the plat accepted, and the record filed in the proper BLM office.

BLM RECORDS SCHEDULES

Schedule 17 - Cartographic, Aerial Photographic, Architectural, Engineering, and Cadastral Survey Records

Item No.	Record Series Description	Disposition Authority
1	CARTOGRAPHIC RECORDS NOT DESCRIBED ELSEWHERE [9160]. **Authority**: Various; see BLM Manual 9160 for listing. **Confidentiality**: Nonpublic record category 3. **Location**: AFO. **Exclusions**: Cartographic records created prior to January 1, 1950, must be offered to NARA before applying the disposition instructions in this schedule.	
	a. **Cartographic Records Prepared During Intermediate Stages of Publication.** Scribed plastic sheets, color separation sheets, composites prepared as a step in the making of color separation sheets, photographic negatives, glass plates negatives, enlargements or reductions, color pulls, proof copies subject to final revision, "correction file" maps annotated to show corrections to be incorporated into the next edition of the published maps, and similar items whose informational content is duplicated by final published map.	TEMPORARY. Destroy when no longer needed for revision. GRS 17/1. Formerly Schedule 17/2.
	b. **Map History Case Files and Source Materials.** Files that chronologically document the planning, surveying, field work, and production and revision of specific maps and files that contain or describe the sources of information for specific maps, including map specifications, location diagrams, notes kept by the cartographers who made the maps, maps or photographs from which information was abstracted, correspondence, reports, bibliographies, lists of sources, and papers that show the origin and spelling of place names.	PROPOSED: PERMANENT. Cutoff EOFY in which map is completed. Transfer to FRC 2 years after cutoff. FRC transfers to NARA 15 years after cutoff.
	c. **Manuscript and Annotated Map Masters.** Hand-drawn maps (generally in pencil, ink, or colors on paper or tracing cloth); maps made with adhesive types of shading, symbols, or letter; and maps that bear significant manuscript annotations, changes, or additions. Included are maps that have been compiled in the office for administrative use, for research, or for exhibits and wall displays; original topographic plane table sheets, terrain sketches, and nautical depth-sounding sheets derived from field observations and surveys; final manuscript smooth sheets and fair sheets that show survey results; maps annotated with field survey information; initial hand-drawn photogrammetric stereo plottings from aerial photos; and proof sheets or overlays that bear annotations resulting from field checking or verification of survey data or that are annotated to show the sources of information used on the map.	PROPOSED: PERMANENT. Cutoff EOFY in which the map is no longer needed for reproduction or updating. Transfer to FRC 2 years after cutoff. FRC transfers to NARA 15 years after cutoff.
	d. **Published Map Masters.** Maps, charts, cartograms, and atlases that have been printed, photographed, or reproduced in multiple copies whether for limited or general distribution. These may be in single-sheet or bound-form. Consists of one copy of each published map, atlas, portfolio, and photomap produced by BLM, including edition and variant, and all related indexes (in map or other form).	PROPOSED: PERMANENT. Cutoff EOFY in which the map is printed and approved for distribution. Transfer to FRC 2 years after cutoff. FRC transfers to NARA 15 years after cutoff. Formerly Schedule 17/3.
	e. **Maps on Microfilm.** Microfilm copies maintained for reference.	Dispose of in accordance with instructions for related hard copy maps.

BLM RECORDS SCHEDULES
Schedule 17 - Cartographic, Aerial Photographic, Architectural, Engineering, and Cadastral Survey Records

Item No.	Record Series Description	Disposition Authority
2	**REMOTE SENSING RECORDS [9162].** Records of remote sensor information systems that provide photographic imagery after conversion or transferral of information from the raw data, exclusive of nonphotographic sensor records such as microwave, radiometer, thermal infrared, thermal ultraviolet, and nonimagery radar. Remote sensing technology covers aerial photographs and other forms of visual images (e.g., digital) of the surface of the earth or other planetary bodies taken from airborne or spaceborne vehicles for the purpose of evaluation, measuring, or mapping the physical features of the landscape. Related tabular and graphic indexes necessary for proper identification and retrieval of these records are also produced. **Authority:** Various; see BLM Manual 9160 for listing. **Confidentiality:** Non-public record category 3. **Exclusions:** All aerial photographic records created prior to January 1, 1950, must be offered to NARA.	
	a. Aerial Photo Duplicate Negatives Unannotated. Duplicate copy negatives, internegatives, rectified negatives, glass plate negatives, and related indexes.	TEMPORARY. Destroy when no longer needed for agency use. GRS 17/2a.
	b. Aerial Photo Prints Unannotated and Related Indexes. When original film negatives exist.	TEMPORARY. Destroy when no longer needed for agency use. GRS 17/2b.
	c-d {Unassigned}	
	e. Aerial Photo Original or Master Negatives and Related Indexes.	PERMANENT. 1) Field Offices cutoff EOFY in which flight is completed and the originals are received and transfer to the Service Center Photo Lab 1 year after cutoff. 2) Service Center Photo Lab cutoff EOFY in which no longer needed for reproduction. Transfer directly to NARA 1 year after cutoff. BLM NARA Job: NC1-49-85-2, 17/16a. **Formerly Schedule 17/16a.**
	f. Aerial Photo Prints and Duplicated Negatives Which Are Annotated.	Use disposal authority for the annotated information (e.g., aerial photos annotated with natural resource inventory data are disposed of under Schedule 4/18a). BLM NARA Job: NC1-49-85-2, 17/16b(1) and c(1).
	g. Satellite Imagery Raw Data Tapes. Copies of infrared, ultraviolet, multispectral (multi-band), video, imagery radar, and related data tapes obtained by BLM from outside sources (e.g., EOSAT and SPOT) for conversion to a film base. Location: SC.	PROPOSED: TEMPORARY. Cutoff EOFY in which no longer needed. Destroy 5 years after cutoff.
	h. Satellite Imagery Conversion Data Tapes. Copies of infrared, ultraviolet, multispectral (multi-band), video, imagery radar, and related data tapes which have been converted to a film base. Location: SC.	PROPOSED: TEMPORARY. Cutoff EOFY in which no longer needed. Destroy 5 years after cutoff.
	i. Conversion Data Film. Created from the data tapes (item h). Location: SC.	PROPOSED: TEMPORARY. Cutoff EOFY in which no longer needed. Destroy 5 years after cutoff.
	j. Satellite Imagery Prints. Developed from film (item i) and distributed by SC to field offices upon request. Location: AFO.	PROPOSED: TEMPORARY. Destroy when superseded or no longer needed for administrative purposes.

Schedule 17 - Cartographic, Aerial Photographic, Architectural, Engineering, and Cadastral Survey Records

Item No.	Record Series Description	Disposition Authority
3	**ARCHITECTURAL DRAWINGS OF TEMPORARY STRUCTURES AND BUILDINGS OR OF BUILDINGS NOT CRITICAL TO BLM MISSION [9100].** Drawings of structures and buildings such as telephone and electric lines, storage sheds, parking lots, and comfort stations. **Authority:** Various; see BLM Manual 9100. **Confidentiality:** Non-public record category 3. **Location:** All. **Exclusions:** Copies in construction project or job files (Schedule 17/21). Architectural drawings created before January 1, 1921, must be offered to NARA.	TEMPORARY. Destroy when no longer needed for administrative purposes. GRS 17/3.
4	**ELECTRICAL, PLUMBING, HEATING, OR AIR CONDITIONING SYSTEMS DRAWINGS [9100].** **Authority:** Various; see BLM Manual 9100. **Confidentiality:** Non-public record category 3. **Location:** All. **Exclusions:** Engineering drawings created before January 1, 1921, must be offered to NARA.	TEMPORARY. Destroy when no longer needed for administrative purposes. GRS 17/4.
5	**CONTRACT NEGOTIATION DRAWINGS [9100].** Drawings prepared during contract negotiation for buildings or objects lacking historical, architectural, or technological significance; drawings re. electrical, plumbing heating, or air condition projects, or drawings superseded by final working and/or as built drawings. **Authority:** Various; see BLM Manual 9100. **Confidentiality:** Non-public record category 3. **Location:** All. **Exclusions:** Copies in contract case files (Schedule 3/3).	TEMPORARY. Destroy when no longer needed for administrative purposes. GRS 17/5.
6	**SPACE FLOOR PLAN FILES [9100].** Outline floor plans indicating occupancy of a building. **Authority:** Various; see BLM Manual 9100. **Confidentiality:** Non-public record category 3. **Location:** All. **Exclusions:** Copies in space assignment case files (Schedule 11/2A).	TEMPORARY. Destroy when no longer needed for administrative purposes. GRS 17/6.
7	**ARCHITECTURAL MODELS [9100].** Models prepared for illustration or presentation. **Authority:** Various; see BLM Manual 9100. **Confidentiality:** Public record category 1. **Location:** All.	TEMPORARY. Dispose of when no longer needed for administrative purposes. *Note: These models may be offered for donation to museums or similar organizations after approval by the BLM Records Officer and NARA under provisions of 36 CFR 1228.60.* GRS 17/7.
8	**ENGINEERING DRAWINGS OF ROUTINE MINOR PARTS [9100].** Drawings of such objects as fasteners, nuts, bolts, wires, screws, nails, pipe fittings, brackets, struts, plates, and beams, if maintained separately or if segregable from a larger file. **Authority:** Various; see BLM Manual 9100. **Confidentiality:** Non-public record category 3. **Location:** AFO. **Exclusions:** Engineering drawings created before January 1, 1921, must be offered to NARA.	TEMPORARY. Destroy when no longer needed for administrative purposes. GRS 17/8.
9	**ENGINEERING DRAWINGS REFLECTING MINOR MODIFICATIONS [9100].** Repetitive engineering drawings of minor modifications made during research and development, and superseded by final drawings, if filed separately of if readily segregable from a larger file. **Authority:** Various; see BLM Manual 9100. **Confidentiality:** Non-public record category 3. **Location:** AFO. **Exclusions:** Engineering drawings created before January 1, 1921, must be offered to NARA.	TEMPORARY. Destroy when no longer needed for administrative purposes. GRS 17/9.

Item No.	Record Series Description	Disposition Authority
10	**PAINT PLANS AND SAMPLES [9100].** Plans and paint samples for painting all areas of buildings lacking historical, architectural, or technological significance, and plans and samples for painting appliances, elevators, and other mechanical parts of all buildings. Authority: Various; see BLM Manual 9100. Confidentiality: Non-public record category 3. Location: AFO.	TEMPORARY. Destroy when no longer needed for administrative purposes. GRS 17/10.
11-18	{Unassigned}	
19	**ENGINEERING SURVEY FIELD NOTES.**	Use disposition authority for related project file (Schedule 17/21a and 21b). BLM NARA Job: NC1-49-85-2, 17/9. **Formerly Schedule 17/9.**
20	**CONSTRUCTION PROJECT ARCHITECTURAL & ENGINEERING DRAWINGS, REFERENCE COPIES.** Copies of drawings, plans, specifications used for reference in planning future projects. Authority: Various; see BLM Manual 9100. Confidentiality: Non-public record category 3. Location: All.	TEMPORARY. Destroy when no longer needed for administrative or reference purposes. BLM NARA Job: NN-171-77, M/28.

Item No.	Record Series Description	Disposition Authority
9	GEOGRAPHIC COORDINATE DATA BASE (GCDB). Electronic file containing coordinates of rectangular and special cadastral surveys including metes and bounds surveys, and a series of attributes related to the coordinates and source document information. The data base is a compilation of the latest public land survey data available in the public sector, compiled from survey plats and field notes, topographic maps, and private, state, and other agency survey data. GCDB does not replace any existing records. **Authority:** 43 CFR 1813, 9180. **Confidentiality:** Non-public record category 3; however, may become discretionary category 2 after verification. **Vital:** Due to the costs associated with recollection of data. **Exclusions:** Records used to test, update, and monitor the system (Schedule 20/1); records associated with the Data Element Dictionary (metadata) (Schedule 20/25); reference copies of any system files which may be destroyed when no longer needed for reference or convenience (Schedule 23/21).	Notes: This system will be accessed by ALMRS (Schedule 30/1). Cadastral Survey group files, field notes, plats, and related files are covered by Schedule 17/31.
	a. **GCDB Project History.** Documenting the history of the conception, planning, and development and/or improvement of the system, excluding system documentation (item b). Consists of the concept of operations, official record designation documentation (aka records transition plan), quality assurance plans, project feasibility studies, cost benefit analyses, charters, approvals, budgets, life cycle management documentation, training plans, briefing and issue papers, and other project history information. Files may be subdivided by subject as volume warrants. **Location:** SC.	TEMPORARY. Cutoff end of FY in which GCDB data collection is completed. Transfer to FRC 1 year after cutoff. FRC destroys 25 years after cutoff. *Pending NARA Job N1-49-94-1.*
	b. **GCDB System Documentation.**	
	(1) **Documentation Necessary for Servicing and Interpreting the System.**	
	(a) **Bureau-Level Documentation.** Completed SF-277 form, data modeling documentation, data system specifications, file specifications, data element descriptions, code books, record layouts, user guides, output specifications, and similar documentation (regardless of media) necessary for servicing and interpreting the system. **Location:** SC.	PERMANENT. Cutoff end of FY in which ALMRS is certified as an official records system. Transfer to NARA Center for Electronic Records 1 year after cutoff. *Pending NARA Job N1-49-94-1.*
	(b) **State-Level Documentation.** Completed SF-277 form and copies of supplemental, state-generated instructions on interpretation of source data, application of data standards, data entry instructions, and similar documentation (regardless of media) necessary for servicing and interpreting the system. **Location:** SO.	PERMANENT. Transfer to NARA Center for Electronic Records with the master file (item d). Retain a copy for reference until no longer needed. *Pending NARA Job N1-49-94-1.*

Item No.	Record Series Description	Disposition Authority
9	(2) **Data Verification and Quality Control Files.** The data verification and quality control process documents the accuracy or factuality of data through a comparison to the source data. Data sampling is a means of checking selected portions of data in a data base to determine its quality level. Error detection involves comparing the data against the source documentation and comparing it with established data standards to determine if the data is in conformance with the standards. Documentation of the sampling and error detection activities consists of the date of action, steps taken, name of parties involved, summary of errors detected with an analysis of the errors, and the date corrective actions are taken. Excludes quality assurance plans which are part of the project history files (item a). In the event of litigation, the records in this series may be required as evidence that the system is trustworthy, accurate, and reliable. Location: SO.	TEMPORARY. Cutoff end of FY in which documentation is created. Transfer to FRC 4 years after cutoff. FRC destroys 25 years after cutoff. *Pending NARA Job N1-49-94-1.*
	c. **GCDB Software.** Application software necessary to use or maintain the master GCDB System. The master is maintained by SC; copies are distributed to SOs. Location: SC, SO.	TEMPORARY. Destroy when superseded or obsolete. *Pending NARA Job N1-49-94-1.*
	d. **GCDB Master Data Files.**	
	(1) **GCDB National Archives File.** Magnetic master, created by each state office at end of each FY, by copying (not moving) all data to tape in a hardware and software independent format as required by 36 CFR 1228.188. Tape will be used use in conjunction with the ALMRS National Archives File (Schedule 30/1d(1)) to reconstruct historical versions of plat graphics, historical indexes, etc. associated with closed cases that have been transferred on tape to NARA. NARA maintains permanent electronic records under environmentally-controlled conditions and provides copies to BLM upon request. Location: SO.	PERMANENT. 1) Initially, at end of FY after ALMRS is certified an official records system, copy all data in the system and transfer to the NARA Center for Electronic Records with a copy of the system documentation (item b(1)(b)) and the ALMRS Archives file (Schedule 30/1d(1). 2) Thereafter, at end of each FY, copy all data in the system and transfer with a copy of the system documentation and the annual version of the ALMRS Archives file to the NARA Center for Electronic Records. *Pending NARA Job N1-49-94-1.*
	(2) **GCDB Duplicate Archive File.** Magnetic tape which is an exact duplicate of the GCDB Archive File created for use in conjunction with the BLM History File tape (Schedule 30/1d(2)) to reconstruct historical versions of plat graphics, historical indexes, etc. associated with closed use cases. Tapes are recopied and revalidated annually. Location: SO.	TEMPORARY. Retain until no longer needed to reconstruct closed use cases. *Pending NARA Job N1-49-94-1.*
	e. **GCDB Backup Tapes.** Electronic file of data identical in physical format to the master file and retained in case the master is damaged or inadvertently erased. Location: SO.	TEMPORARY. Delete after the identical records are deleted, or when replaced by a subsequent security backup file. Reference GRS 20/8a.

Schedule 30 - Automated Lands and Minerals Records System

Item No.	Record Series Description	Disposition Authority
9	f. **GCDB Input/Source Documentation.** Data entry sheets, nonrecord copies of case documents, and electronic versions of input/source documents that are used solely to create, update, or modify the records in an electronic medium and are not required for audit or legal purposes. Non-electronic examples include annotated paper copies of cadastral survey plats and notes; electronic examples include raw data, organized data with control, pre-subdivision file, final geographic coordinate file, boundary transfer, final coordinates in UTM, township and corner attributes, graphic overlay, used control plus transferred boundaries, available control, statistics files, and source attribute files.	TEMPORARY. Destroy or delete after the information has been converted to an electronic medium and verified, or when no longer needed to support the reconstruction of, or serve as the backup to, the master file (item d), whichever is later. Reference GRS 20/2a-b.
	g. **GCDB Outputs.** Information generated for reference purposes by computer and placed on outside medium such as paper or electronic storage medium. Excludes outputs that may become a part of official files; the disposition of such outputs will be governed by the disposition authority for the files to which they relate. Location: May be found at all organizational locations.	TEMPORARY. Destroy or delete when no longer needed for current business. *Pending NARA Job N1-49-94-1.*

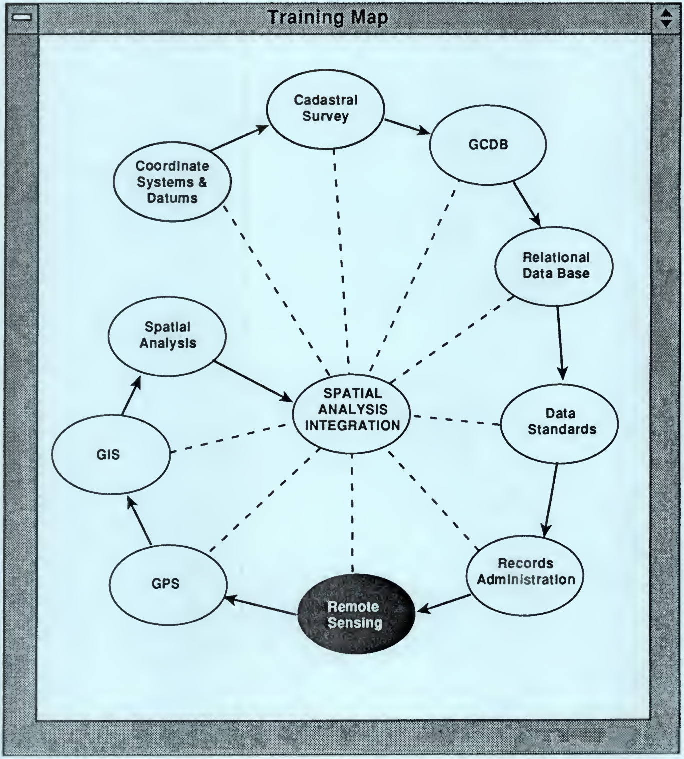
Data Stewards

Data Base Administrators

OFFICE	NAME	FTS/COMM	FAX	EMS
AK-940	Linda Ricketts	(907)271-4645	4595	!AKdataadm
AZ-954	Steve Wing	(602)650-0280	0556	!SWing
CA-950				
CO-954	Adrian Caufield	(303)239-3941	3931	!CO954D
ES-954	John Butterfield	(703)440-1636	1559	!J1Butter
ID-950	Ed Roberts	(208)384-3227	3288	!E1Robert
MT-950	Rick Dickman	(406)255-2807		blmmt!mt910!rdickman
NV-950	Otis Weimer	(702)785-6421	6411	!OWeimer
NM-954	Cathy Cooney	(505)438-7534	7616	!NM954IRM
OR-950	Stan Frazier	(503)280-7009	7419	!S1Frazie
UT-950	Tom Jensen	(801)539-4054	4183	!TJensen
WY-950	Wally Stiles	(307)775-6086	6082	!WY950B
RP-210	Judy Crosby	(208)387-5480	2746	!J1Crosby
RP-120	John Gebhard	(208)334-1310		
DW-110	Melanie Rhinehart	(303)236-9940	0831	!SC322DA

BLM Library
Denver Federal Center
Bldg. 50, OC-521
P.O. Box 25047
Denver, CO 80225

GEO - DATA COLLECTION & USE
(for Ecosystem Based Management)



Course No. 1730-11

REMOTE SENSING

LESSON OBJECTIVE

By discussion and examination of remotely sensed data the Trainee will be able to:

☞ Learn the two basic categories of remote sensing.

☞ Discuss the importance of using remotely sensed data as a spatial data collection tool.

☞ Be able to select the appropriate scale for a particular application.

☞ Look at and compare various types of remote sensing data; analog and digital.

Remote Sensing is the art and science of obtaining information about an object or phenomenon without physical contact.

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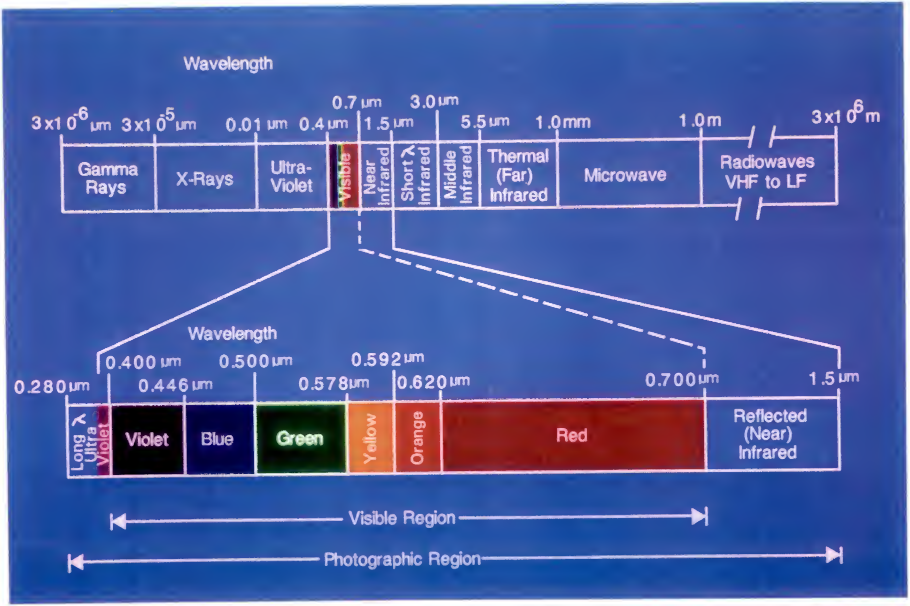
P.O. Box 25047
Denver, CO 80225


Wavelength
0.7 µm
3.0 µm
3 x 10^-6 µm
3 x 10^-5 µm
0.01 µm
0.4 µm
1.5 µm
5.5 µm
1.0 mm
1.0 m
3 x 10^6 m
Gamma Rays
X-Rays
Ultra-Violet
Visible
Near Infrared
Short λ Infrared
Middle Infrared
Thermal (Far) Infrared
Microwave
Radiowaves VHF to LF
Wavelength
0.400 µm
0.500 µm
0.592 µm
0.280 µm
0.446 µm
0.578 µm
0.620 µm
0.700 µm
1.5 µm
Long λ Ultra Violet
Violet
Blue
Green
Yellow
Orange
Red
Reflected (Near) Infrared
Visible Region
Photographic Region

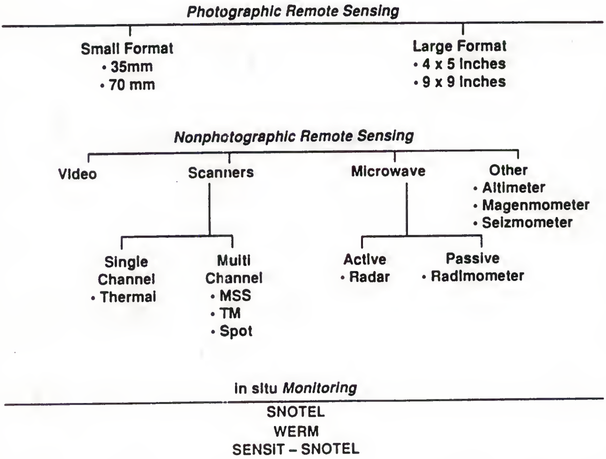
☞ Cartography

☞ Photo Interpretation

☞ Photogrammetry

☞ GIS / Digital Image Processing

Classification of Remote Sensing
(Based on sensors)



How do I select a tool?

Is Remote Sensing appropriate for my application?

☞ Determine application level

☞ Determine level of accuracy needed

☞ Determine availability of data

LARGE SCALE	SMALL SCALE
1:2,400 to 1:15,840 Used for special projects and photogrammetric work	1:24,000 - 1:62,500 for resource applications
	1:62,500 - 1:1,000,000 for regional applications
Objects appear larger	Objects appear smaller
Frame covers smaller area	Frame covers larger area
Requires more photos to cover area of interest	Requires fewer photos to cover area of interest
Larger the scale, higher the cost	Smaller the scale, lower the cost

RESOLUTION

☞ Aerial Photography

1.5 - 2 meters at 1:4,000 scale

0.1 meters at 1:2,400 scale

☞ Satellite Imagery

Landsat Thematic Mapper 30m cell size,
MSS 80cm cell size

SPOT 10m panchromatic cell,
20m MSS cell size

AVHRR 1km cell size

Photographic scale coverage for estimating photo coverage per 100,000 acres.[1]

Photo scale	Number acres per square inch	Number acres per photo[2] (3.6 by 6.3 inches)	Number photos per 100,000 acres
1:2,400	1	23	4,348
1:4,800	4	91	1,099
1:6,000	6	136	735
1:12,000	23	522	192
1:15,840	40	907	110
1:20,000	64	1,452	69
1:24,000	92	2,087	48
1:40,000	255	5,783	17

[1] Aldrich, Robert C., 1979. Remote Sensing of Wildland Resources: A State-of-the-Art Review, General Technical Report RM-71.; Table 4., p.33.

[2] 60%overlap; 30% sidelap

AVAILABILITY OF DATA

- ☞ Aerial Photography
  - BLM - resource block, strip (riparian, special)
  - NAPP, NHAP
  - APSRS
- ☞ Satellite Imagery
  - Landsat Thematic Mapper
  - SPOT
  - AVHRR

APPLICATION TYPES

☞ Inventory

☞ Modeling

☞ Monitoring

APPLICATION LEVELS

☞ Regional Application

1:62,500 and smaller

☞ Resource Applications

Resource base data collection
1:12,000 - 1:25,000

Resource planning and baseline data
1:24,000 - 1:62,500

☞ Site Specific

1:12,000 and larger

~~COURSES AVAILABLE~~

☞ ~~Basic Aerial Photo Interpretation~~

☞ ~~Digital Remote Sensing~~

☞ ~~Introduction to Image Processing / ERDAS~~

MODERNIZATION IMPACT

- ☞ Target System Implementation
  - Hardware
  - Software - ARC/INFO, ERDAS, Imagine
- ☞ ALMRS Capability
- ☞ USGS DOQ Program

REFERENCES AVAILABLE

- ☞ Remote Sensing and Image Interpretation, Lillsand and Kieffer, 2nd Edition

- ☞ Introduction to Digital Image Processing, J. R. Jensen

- ☞ The Geo-Position Selection Guide for Resource Management, BLM Technical Note 389, J. B. Keating, Jr.

- ☞ The Photogrammetric Engineering and Remote Sensing

COURSES AVAILABLE

- ○ Basic Aerial Photo Interpretation
- ○ Digital Remote Sensing for GIS and Resource Specialists
- ○ Basic Image Processing

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
BLM MANAGERS COURSE GUIDE

Course Number:
9160-1

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1. Course Title:
Basic Aerial Photo Interpretation

2. Duration of Course: 3 days	3. Program Office: SC-215C

4. Performance Objectives (the measurable performance expected from trainees upon completion of training):

a. Distinguish between the different types of aerial photography and list the advantages and disadvantages of each.
b. Determine photo scale with the use of map, photo, stereoscope and scale.
c. Determine area (in acres) from map/photos with the use of dot grid.
d. Distinguish drainage, vegetation and land use features from aerial photos.

5. Brief Description of Course:
The course covers the following topics:

a. Discussion of aerial films (black-and-white, color, color infrared) and reproduction mediums.
b. Stereo viewing exercises
c. Geometry of aerial photography
d. Photo overlay preparation
e. Interpretation exercises
f. Field verification
g. Mapping techniques and orthophotography
h. Data acquisition.

7. Target Group: Resource specialists in all activities who have not had formal training in aerial photo interpretation.

8. Remarks: There is no per student charge for the class. The class is conducted at field office locations upon request. Trainees' per diem and travel (if necessary) are to be paid by home office. The requesting office is asked to cover per diem and travel for SC-215C instructors. Contact: Pam Clemmer (303)236-0824 for scheduling information.

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
BLM MANAGERS COURSE GUIDE

Course Number:
9160-2

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1. Course Title:
Digital Remote Sensing for GIS Specialists

2. Duration of Course: 5 days	3. Program Office: SC-215C

4. Performance Objectives (the measurable performance expected from trainees upon completion of training):

a. Become familiar with the different types of remote sensing technologies and their applications.
b. Understand the basic physics of the electromagnetic spectrum and how it relates to remote sensing technology.
c. Perform analog classification to understand how digital classification is accomplished.
d. Learn how and where to acquire remotely sensed data.
e. Apply specific field verification and accuracy assessment techniques to classifications derived from remotely sensed data.

5. Brief Description of Course:

This course is designed to teach GIS specialists to understand and efficiently utilize digitally acquired remotely sensed data for ecosystem management applications. The course includes discussion on commonly available types of remote sensing data (e.g. aerial photography, videography), but concentrates primarily on understanding and learning applications of satellite acquired multispectral scanner digital data. Instruction consists of lectures, analog and digital exercises (when equipment is available), discussions, and a 1-day field trip. The course covers the following topics:

a. Electromagnetic spectrum and physics of light
b. Multispectral scanner systems and the information they provide (Landsat, SPOT, AVHRR) and applications
c. Thermal and Radar technology and applications
d. How to acquire remotely sensed data.
e. Basic concepts of digital image processing
f. Field verification and accuracy assessment

7. Target Group: GIS specialists that are actively involved with image processing technology and need to understand digital remote sensing theory applications.

8. Remarks: This course is a prerequisite to the Basic Image Processing course (9160-4).

There is no per student charge for the class. The class is conducted at the SC once or twice per year, and field office locations upon request. Trainees' per diem and travel to be paid by home office. If the course is requested at a field office location, the requesting office is asked to cover per diem and travel for two SC instructors. Contact: Pam Clemmer (303)236-0824 for scheduling information.

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
BLM MANAGERS COURSE GUIDE

Course Number:
9160-3

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1. Course Title:
Digital Remote Sensing for Resource Specialists

2. Duration of Course: 3 days	3. Program Office: SC-215C

4. Performance Objectives (the measurable performance expected frm trainees upon completion of training):
   a. Become familiar with the different types of remote sensing technologies and their applications.
   b. Understand the basic physics of the electromagnetic spectrum and how it relates to remote sensing technology.
   c. Apply specific field verification and accuracy assessment techniques to classifications derived from remotely sensed data.

5. Brief Description of Course:
This course is designed to help resource specialists understand and efficiently utilize digitally acquired remotely sensed data for ecosystem management applications. Although the course guide includes discussion on commonly available types of remote sensing data (e.g. aerial photography, videography), this course concentrates primarily on understanding and learning applications of satellite acquired multispectral scanner digital data. Instruction consists of lectures, analog and digital exercises (when equipment is available), discussions, and a 1-day field trip. The course covers the following topics:
   a. The basic categories of remote sensing
   b. Electromagnetic spectrum and physics of light
   c. Multispectral scanner systems and the information they provide (Landsat, SPOT, AVHRR)
   d. Various applications of the data
   e. Basic concepts of digital image processing
   f. Field verification and accuracy assessment

7. Target Group: Resource specialists that need to understand digital remote sensing technology and its application to their field.

8. Remarks: There is no per student charge for the class. The class is conducted at the SC once or twice per year, and field office locations upon request. Trainees' per diem and travel to be paid by home office. If the course is requested at a field office location, the requesting office is asked to cover per diem and travel for two SC instructors. Contact: Pam Clemmer (303)236-0824 for scheduling information.

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
BLM MANAGERS COURSE GUIDE

Course Number:
9160-4

---

1. Course Title:
Basic Image Processing

---

2. Duration of Course: 5 days	3. Program Office: SC-215C

4. Performance Objectives (the measurable performance expected form trainees upon completion of training):

a. Be able to transfer data into ERDAS format from available storage media (i.e., 8mm tape, CD-ROM).
a. Set up naming conventions for image files.
b. Learn how to view different types of data and data information in a viewer window.
c. Learn various ways to enhance the imagery to optimize viewing.
d. Learn how to statistically categorize (classify) imagery.
e. Be able to geographically reference (rectify) an image using a map, a previously rectified image, or a coordinate file.
f. Given an image, construct a simple map composition.

5. Brief Description of Course:
The course covers the following topics:

a. Data entry techniques
b. Basic file management issues
c. Data viewing
d. Data enhancement techniques
e. Classification techniques
f. Rectification procedures
g. Map composition basics

7. Target Group: GIS specialists who have completed the *Digital Remote Sensing (9160-2)* five-day course, or have demonstrated a firm understanding of remote sensing theory.

8. Remarks: This course does not teach the theory (sound scientific principles) behind the statistical algorithms. The prerequisite course *Digital Remote Sensing (9160-2)* provides the background necessary to complete this course. The intent of this course is to teach the functionality of the software only. No theory will be discussed.

System H/W and S/W configuration issues should be resolved with the instructor prior to the course.

There is no per student charge for the class. The class is conducted at the SC once or twice per year, and field office locations upon request. Trainees' per diem and travel to be paid by home office. If the course is requested at a field office location, the requesting office is asked to cover per diem and travel for two SC-215C instructors. Contact: Pam Clemmer (303)236-0824 for scheduling information.

APSRS Project Description Codes

Agency Code
All contributors are listed alphabetically by an agency code.

Rpt Typ (Report Type)
1 = county format
2 = 7.5-minute quad format
3 = four-corner format

Q/W (Quadrant of the World)
1 = northeast
2 = northwest

SE Corner, Lat/Log—Deg/Min
Degree and minute of latitude and longitude of southeast corner of 7.5-minute quadrangle. Information listed in increasing degrees of longitude.

Image Scale
Scale of photographs expressed as a whole number (some scales were derived using flight height and camera focal length).

Focal Lengt (Focal Length)
01 = 1.75 in or 44 mm
02 = 3 in or 76 mm
03 = 3.46 in or 88 mm
04 = 6 in or 152 mm
05 = 8.25 in or 210 mm
06 = 12 in or 305 mm
07 = 24 in or 610 mm
08 = 3.96 in or 101 mm
09 = 9.430 in or 240 mm
10 = 6.738 in or 171 mm
11 = 3.35 in or 206 mm
20 = other

Cloud Cover (Percentage of)
0 = 0%
1 = 10%
2 = 20%
3 = 30%
4 = 40%
5 = 50%
6 = 60%
7 = 70%
8 = 80%
9 = 90%

Cam Spec (Camera Specifications)
Indicates if camera meets calibration specifications.
Y = Yes N = No Blank = Unknown

Quad Cover (Quadrangle Coverage)
1 = 10%
2 = 20%
3 = 30%
4 = 40%
5 = 50%
6 = 60%
7 = 70%
8 = 80%
9 = 90%
0 or blank = 100%

FIPS Code, State/County
Assigned State and county numbers using Federal Information Processing Standards publication codes.

Date of Coverage, Yr/Mo/Day
Year, month, and day photography flown. Date also reflects estimated time of completion for planned projects.

Sta (Status)
1 = photography planned
3 = photography completed

Agency Project Code
An agency's project identification.

Film Type (Emulsion)
1 = black and white infrared
2 = color infrared
3 = color
4 = black and white
5 = thermal
9 = other

Film Fmt (Film Format)
1 = 2.76 in × 2.76 in or 70 mm × 70 mm
2 = 4.5 in × 4.5 in or 11 cm × 11 cm
3 = 9 in × 9 in or 23 cm × 23 cm
4 = 9 in × 18 in or 23 cm × 46 cm
5 = 7 in × 7 in or 18 cm × 18 cm
6 = 7 in × 9 in or 18 cm × 23 cm
7 = 6 in × 8 in or 15 cm × 20 cm
9 = other

Sens Clas (Sensor Class)
1 = vertical carto (implies stereo)
2 = vertical reconnaissance
3 = side-looking airborne radar
4 = oblique
9 = other

Remarks
This is a dual-purpose field. The heading REMARKS refers usually to free-form data entered by agencies other than NASA. For example, the USFS frequently enters the name of a national forest. The USGS usually enters "QUAD-CENTERED" on planned and in-progress photographs and a microfilm identification on completed photographs. The subheadings:

Scene	Frames		Cassette	
ID	From	To	No.	Frame

are aligned with entries for NASA data only, and identify the actual photographic frame range containing the quadrangle coverage and the microfilm cassette locator information for previewing the photographs.

State Remote Sensing Coordinators

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Bruce Keating
(307)-775-6245
Gretchen Meyer
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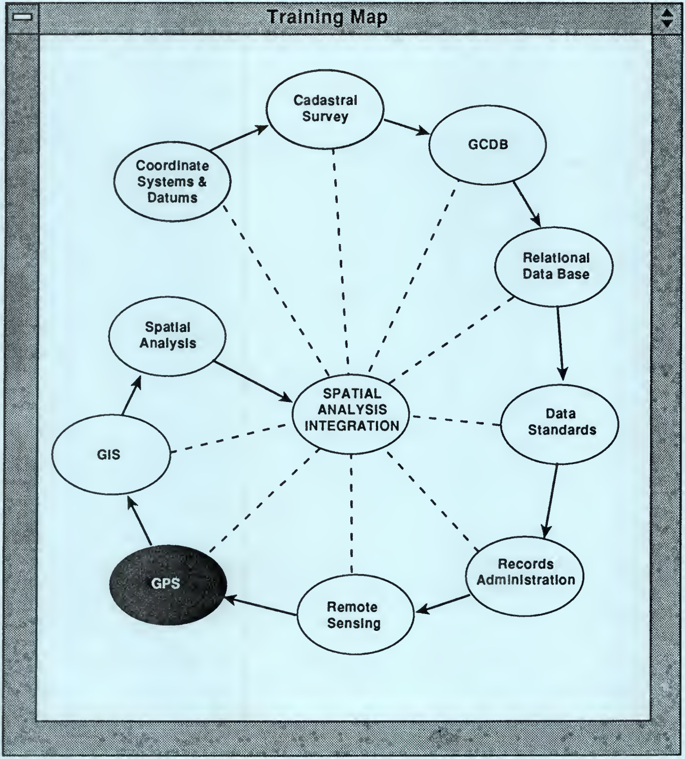
GEO - DATA COLLECTION & USE
(for Ecosystem Based Management)



Course No. 1730-11

BLM Library
Denver Federal Center
Bldg. 50, OC-521
P.O. Box 25047
Denver, CO 80225

GLOBAL POSITIONING SYSTEM (GPS)

LESSON OBJECTIVE

By discussion of the principles of GPS and utilizing GPS receivers the Trainee will be able to:

☞ Learn GPS capabilities and applications.

☞ Obtain general knowledge of how GPS works.

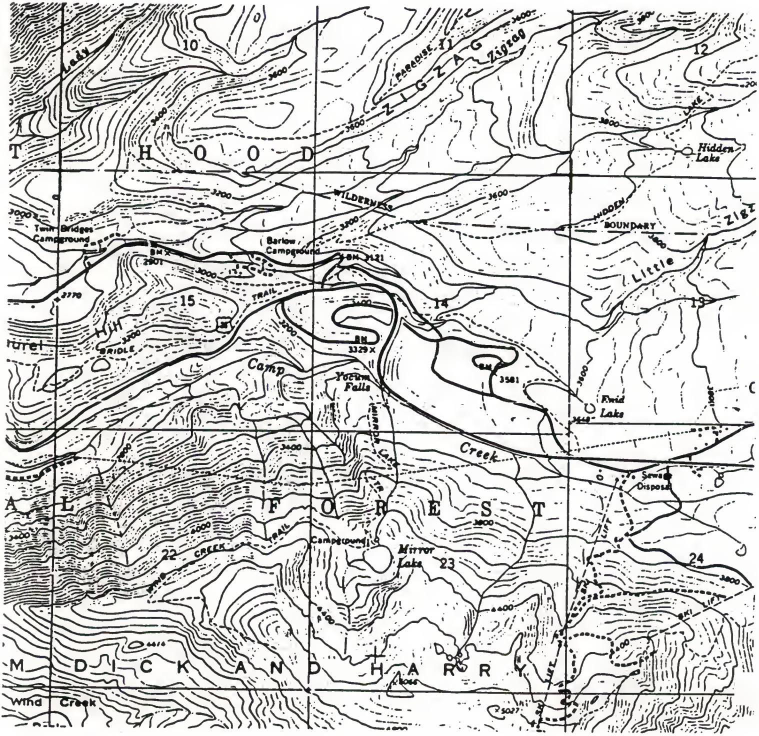
☞ Know accuracy of GPS factors that affect positioning accuracy.

☞ Learn factors which limit GPS use on a project.

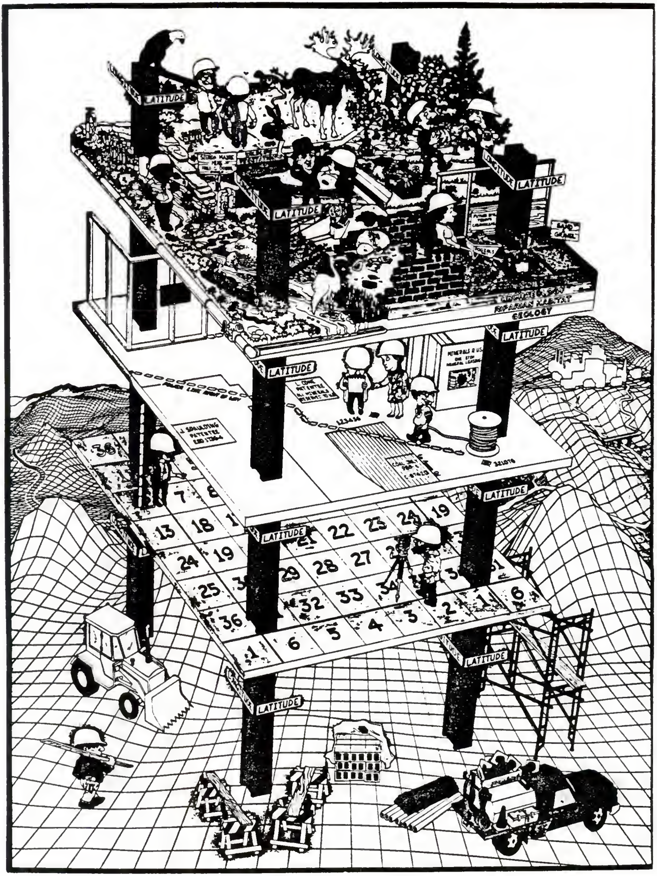
“You're a latitude-and-longitude person, which will be helpful to you, I'm sure in 1995”

GPS BASICS

POINT POSITIONING APPLICATIONS



GEOGRAPHIC INFORMATION SYSTEMS



(GIS)

GPS BASICS - APPLICATIONS

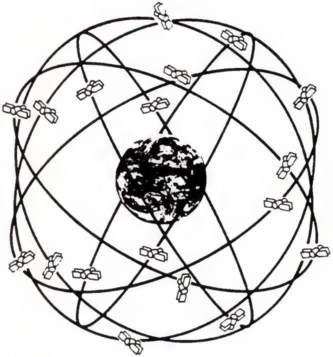
☞ **Point Positioning**

- Low Accuracy Surveys
- Map Updates
- GIS Layer Production / Maintenance
- Road / Trail Inventory
- Resource Data
- Navigation

☞ **Relative Positioning**

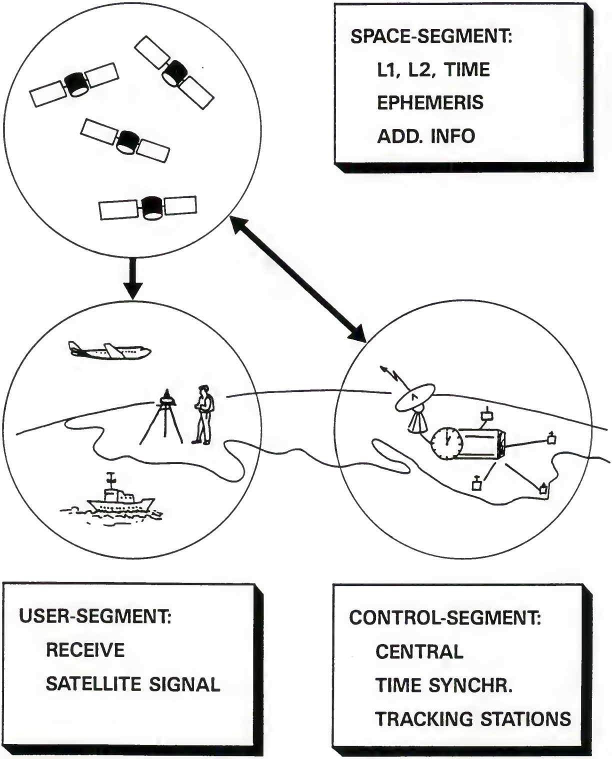
- GIS Control Surveys
- Photogrammetric Control
- Cadastral Surveys
- Site Monitoring
- Wilderness Boundary Surveys

SATELLITE CONSTELLATION



21 SATELLITES + 3 spares
6 ORBITAL PLANES
55° INCLINATION
20 200 KM ABOVE EARTH
12-HOUR ORBITS
5 HOURS ABOVE HORIZON

THREE SEGMENTS



SPACE-SEGMENT:

- L1, L2, TIME
- EPHEMERIS
- ADD. INFO

USER-SEGMENT:

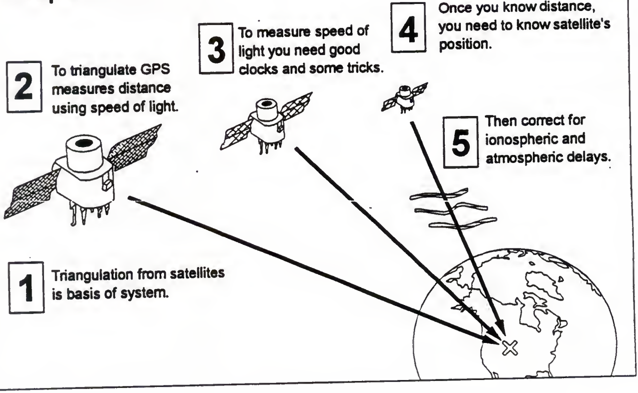
- RECEIVE
- SATELLITE SIGNAL

CONTROL-SEGMENT:

- CENTRAL
- TIME SYNCHR.
- TRACKING STATIONS

How Does GPS Work?

5 Steps to GPS



1 Triangulation from satellites is basis of system.

2 To triangulate GPS measures distance using speed of light.

3 To measure speed of light you need good clocks and some tricks.

4 Once you know distance, you need to know satellite's position.

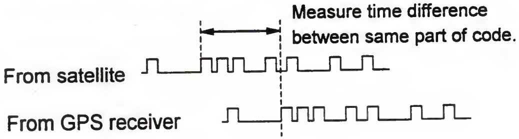
5 Then correct for ionospheric and atmospheric delays.

Speed-of-Light Measurement

- Measure how long it takes the GPS signal to get to us.
- Multiply that time by 186,000 miles per second.
    - Time (seconds) X 186,000 = miles
- If you've got good clocks, all you need to know is exactly when the signal left the satellite.

How do we know when the signal left the satellite?

- Use same code at receiver and satellite.
- Synchronize satellites and receivers so they are generating the same code at the same time.
- Then we look at the incoming code from the satellite and see how long ago our receiver generated the same code.



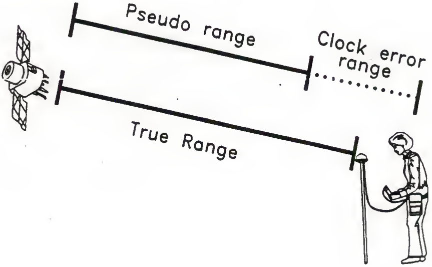
Measure time difference between same part of code.

From satellite

From GPS receiver

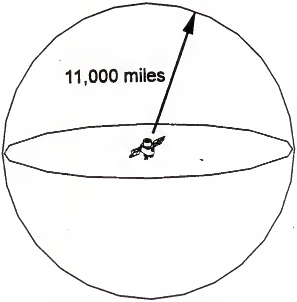
Travel Time

- The Travel Time as measured is called the Pseudo Range, it consists of:
  - the true range
  - and range due to clock error (clock bias).



Triangulation

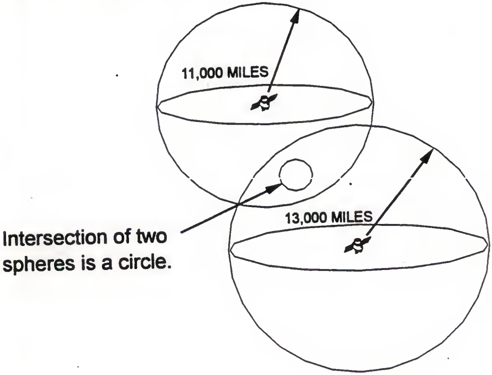
One measurement narrows down our position to the surface of a sphere.



We're somewhere on the surface of this sphere

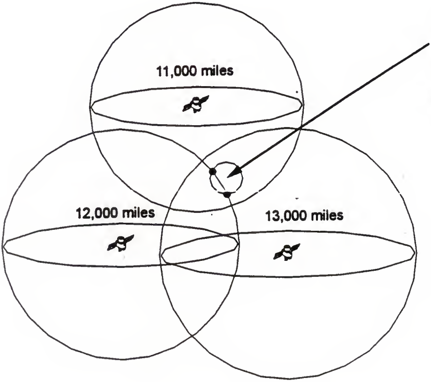
Triangulation

Second measurement narrows it down to intersection of two spheres.



Triangulation

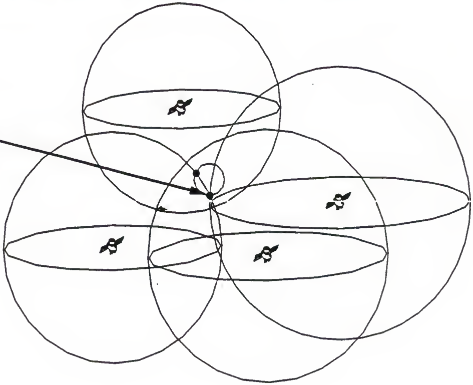
Third measurement narrows to just two points.



Intersection of three spheres is only two points.

Triangulation

Fourth measurement will decide between two points.



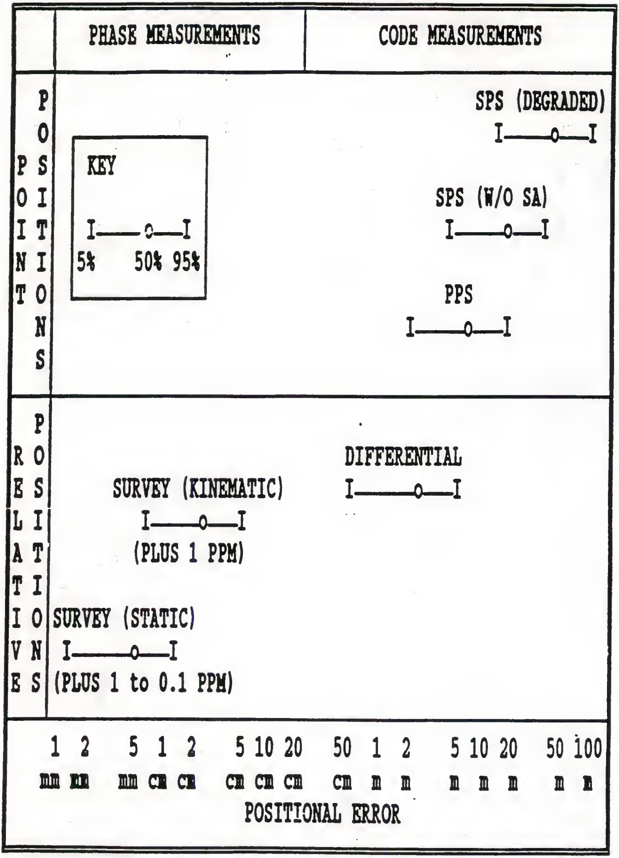
Fourth measurement will only go through one of two points

Triangulation

In practice 3 measurements are enough.

- We can discard one point
- One point will be a ridiculous answer
  - out in space
  - or moving at high speed
- But we do need 4th measurement in order to solve for clock bias (error).

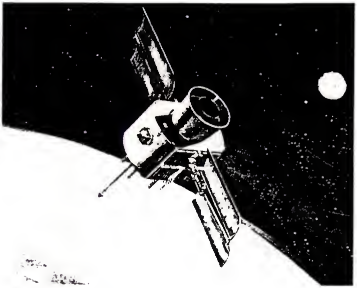
GPS POSITIONING ACCURACIES

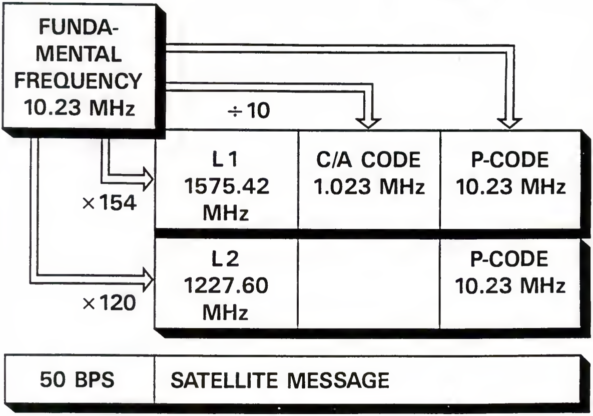


SA - SELECTIVE AVAILABILITY, SPS - STANDARD POSITIONING SERVICE
PPS - PRECISE POSITIONING SERVICE, PPM - PARTS-PER-MILLION

9/88

SATELLITE SIGNAL





FUNDAMENTAL FREQUENCY 10.23 MHz

÷10

×154

×120

L1 1575.42 MHz

C/A CODE 1.023 MHz

P-CODE 10.23 MHz

L2 1227.60 MHz

P-CODE 10.23 MHz

50 BPS

SATELLITE MESSAGE

Selective Availability (S/A)

- The Government (DoD) can introduce artificial clock and ephemeris errors to throw the system off.
- Prevents hostile forces from using it.
- When operating, it is the worst source of error.

Other errors

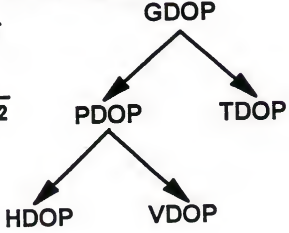
- Atomic clock errors
  - Very minor and mostly adjusted by DoD
- Receiver errors
  - Problems like "round-off" and subtle software bugs
- Multipath interference
  - Signal bounces off other objects and interferes with the straight-line signal
  - Good receivers use advanced signal processing and good antennae
- Relative positions of satellites affect accuracy

Dilution of precision

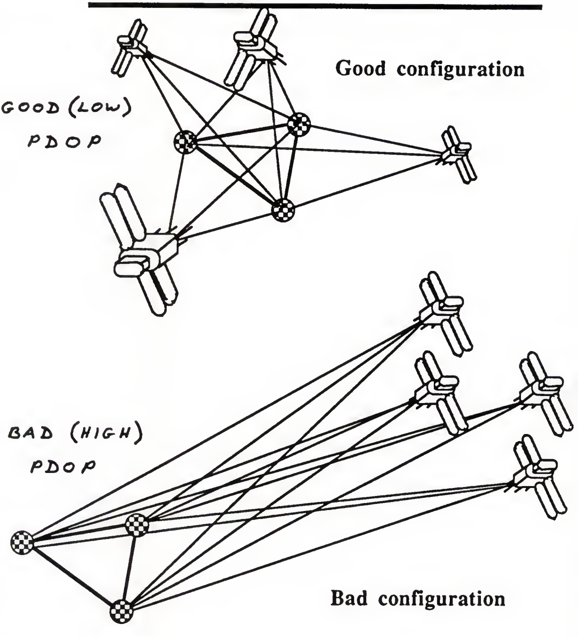
- HDOP = Horizontal dilution of precision
- VDOP = Vertical dilution of precision
- PDOP = Position dilution of precision
- TDOP = Time dilution of precision (clock bias)
- GDOP = Geometric dilution of precision

$$\text{GDOP} = \sqrt{(\text{PDOP})^2 + (\text{TDOP})^2}$$

$$\text{PDOP} = \sqrt{(\text{HDOP})^2 + (\text{VDOP})^2}$$



SATELLITE CONFIGURATION SELECTION



Good configuration

GOOD (LOW) PDOP

BAD (HIGH) PDOP

Bad configuration

© Canadian GPS Associates, May 1987

4.3.4 Avoiding 2D Positions

Collecting 2D positions is not recommended because of the problem encountered with the altitude measurement. When you set the receiver to calculate 2D positions, you are replacing one satellite measurement (altitude) with a fixed measurement. If this altitude is incorrect, the latitude and longitude will also be incorrect. For example, if the fixed altitude is incorrect by 10 meters, the calculated horizontal measurements can be incorrect by 50 meters or more. This horizontal error cannot be removed by differential correction.

You may accurately know the altitude with respect to mean sea level (MSL), but GPS determines altitude by height above the WGS-84 ellipsoid (HAE), not MSL. The difference between the two can be great. HAE to MSL conversion algorithms can have errors of greater than 5 meters. HAE on the most accurate commercially available ellipsoid maps is only ± 1 meter. For the best results, contact a surveyor to get the ellipsoid height and the exact separation between the ellipsoid and the geoid for your area of operation.

4.3.5 Elevation Mask

The elevation mask is the elevation angle above the horizon, below which satellites are not used. For land-based applications where there are local obstructions (foliage, buildings, etc.), system performance is smoother with an elevation mask of 15° to 20°. The default elevation mask in Trimble GPS receivers is 15°.

When a satellite is low on the horizon, two problems can occur. First, the satellite signals must travel a greater distance through the atmosphere, resulting in lower signal strength and delayed reception by the GPS receiver (propagation delays). Since the distance to the satellite is calculated by the travel time, a slight delay in travel time can result in a large error in calculated distance.

Trimble

ERRATA SHEET: *Pro XL System Operation Manual*

Date: 13 June 1994

Certain sections of the *Pro XL System Operation Manual* have been edited to improve understanding or to correct errors in information. Please read the following information carefully.

SECTION: 1.3.2 Factors Affecting Accuracy

The accuracy that you can obtain during data collection depends on several factors including the multipath environment, type of measurements and logging intervals set on the base and rover systems, distance between base station and rover receivers, Position Dilution of Precision (PDOP), Signal-to-Noise Ratio (SNR), satellite elevations, and the type of base station.

Accuracy of the Pro XL receiver without differential correction is 100 meters (2dRMS). For a detailed explanation of each of the factors affecting accuracy, refer to section 3.3 in Chapter 3.

Accuracy of the Pro XL System with differential correction is better than 1 meter (RMS) + 10 ppm times the distance between the base and the rover given the following conditions:

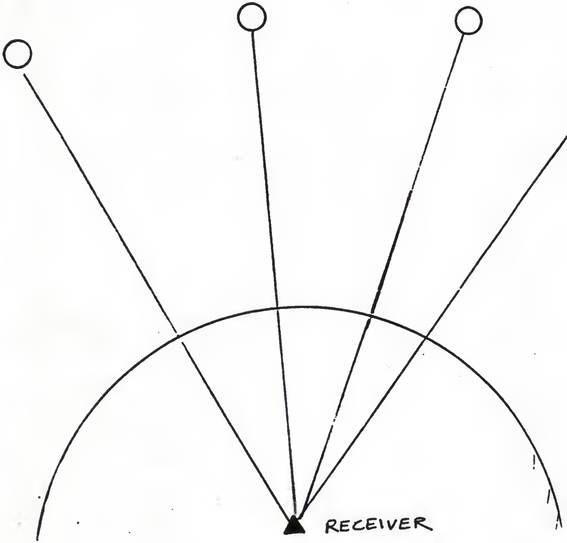
1 mtr/ 100,000 mtr
= 1 mtr/ 62 mi

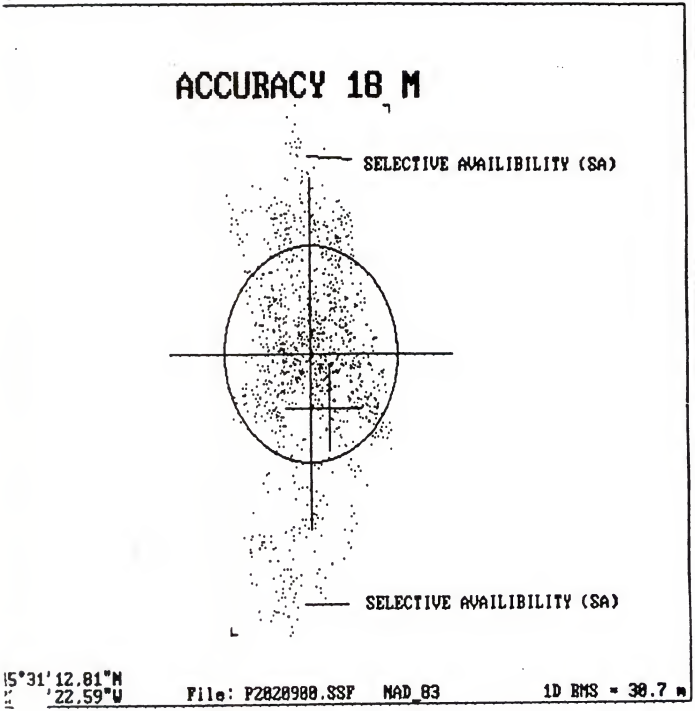
- Number of visible satellites: ≥ 4
- PDOP: < 4
- Signal to Noise Ratio: > 6
- Satellite Elevation Mask: ≥ 15°
- Differential correction is performed with MCORR300 v3.43 or later. The appropriate version of the differential correction program is available with PFINDER v2.50 or later.
- Base station data must be recorded with SYNCHRONIZED MEASUREMENTS (also referred to as SYNCED MEASUREMENTS). **Synchronized measurements occur when measurements from all satellites tracked by the base and rover receivers are made at the same logging interval and are synchronized to the start of the GPS week.**

  Synchronized measurements can be recorded with the following compatible base stations: the Pro XL System when the Asset Surveyor software is in Base Station mode; the Pro XL System when the PathLog software is set with Decimeter Mode ON before Base Station mode is started; a 12-channel Maxwell-based Community Base Station (CBS) when Logging Rate is set to Synced Measurements; or a Trimble Maxwell-based 4000 Series receiver (4000 SSE or specific 4000 SE receivers listed in the following note).

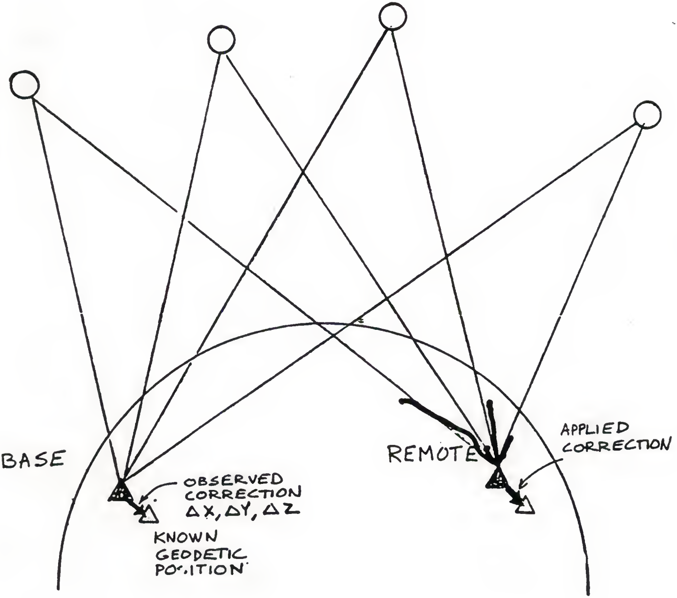
W

POINT POSITIONING
AUTONOMOUS MODE

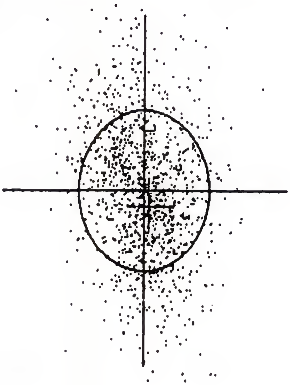



ACCURACY 18 M
SELECTIVE AVAILIBILITY (SA)
SELECTIVE AVAILIBILITY (SA)
5°31'12.81"N
'22.59"W
File: P2020900.SSF
NAD_83
1D RMS = 30.7 m

POINT POSITIONING
DIFERENTIAL MODE

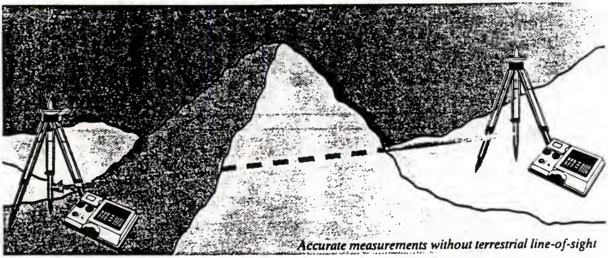


ACCURACY 1.3M



15°31'12.33"N
2°40'22.96"W File: P2020900.COR NAD_83 1D RMS = 5.5 m

GPS VERSUS CLASSICAL SURVEYING


Accurate measurements without terrestrial line-of-sight

INTERVISIBILITY NOT NEEDED

WEATHER INDEPENDENT

NETWORK INDEPENDENT SITE SELECTION

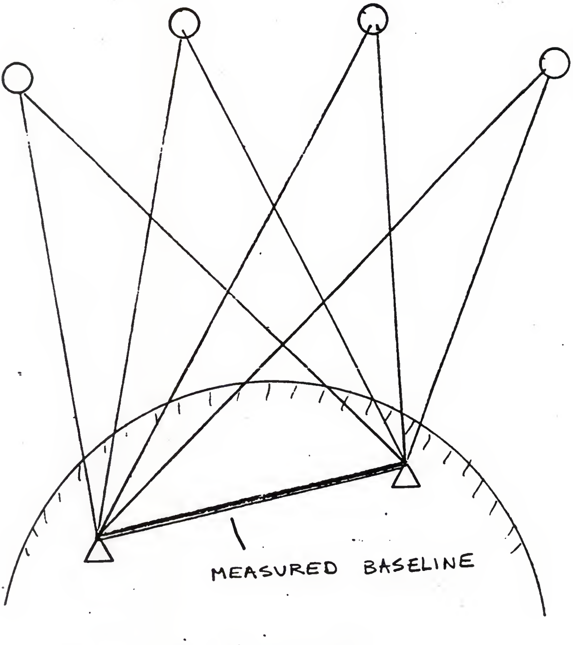
GEODETIC ACCURACY

ECONOMIC ADVANTAGES

DAY AND NIGHT OPERATION

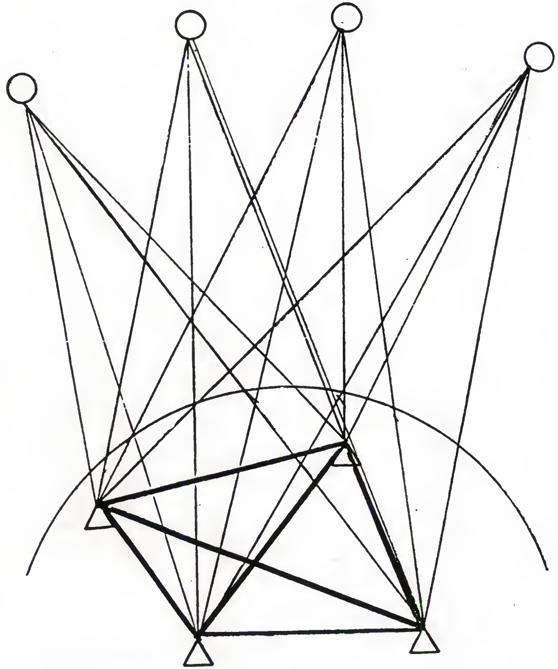
RELATIVE POSITIONING

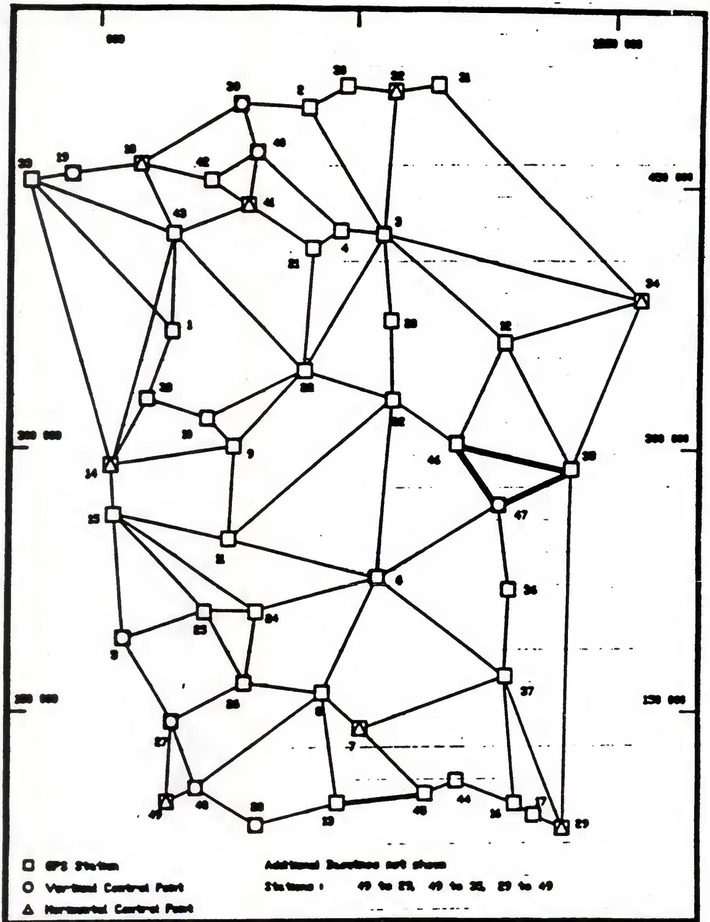
SINGLE BASELINES



ΔX, ΔY, ΔZ
CARTESIAN COORDINATES
(WGS 84)

RELATIVE POSITIONING
NETWORK





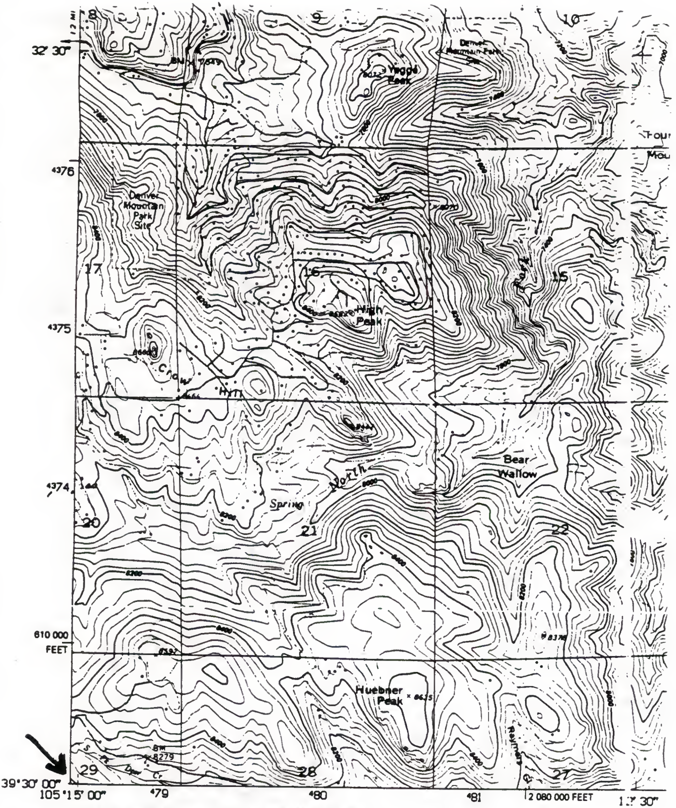
SISKIYOU FOREST

Fig : 6

ADJUSTED NETWORK

Job No. : 89-[illegible]

Date : Oct/Nov 1987



(PINE)
4962 IV NE

Produced by the United States Geological Survey

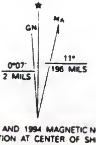
Control by USGS and NOS/NOAA

Compiled from aerial photographs taken 1954 and 1955. Revised from aerial photographs taken 1988 and 1990 and other sources. Field checked 1965. Map edited 1994. Contours and land elevations have not been revised and may conflict with other content

North American Datum of 1927 (NAD 27). Projection and blue 1000-meter Universal Transverse Mercator ticks, zone 13 10 000-foot ticks: Colorado Coordinate System, central zone

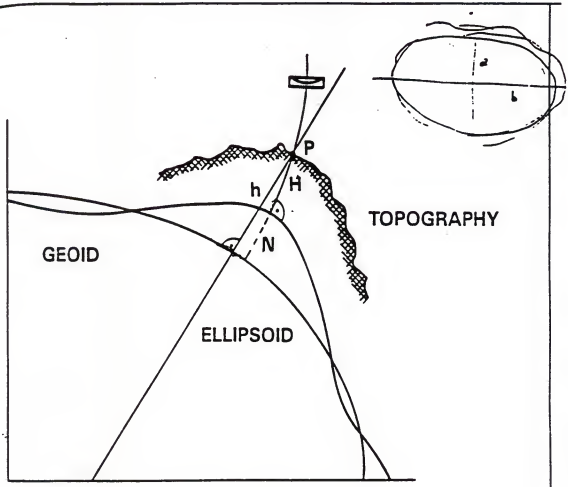
North American Datum of 1983 (NAD 83) is shown by dashed corner ticks. The values of the shift between NAD 27 and NAD 83 for 7.5-minute intersections are obtainable from National Geodetic Survey NADCON software

Fine red dashed lines indicate selected fence and field lines where generally visible on aerial photographs. This information is unchecked



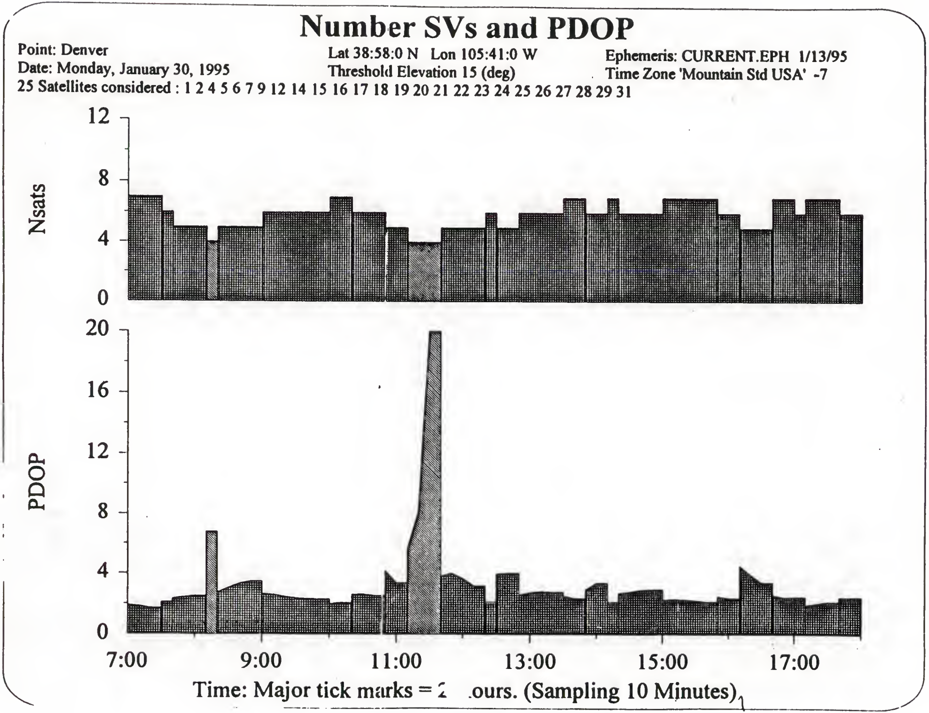
UTM GRID AND 1994 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

HEIGHT

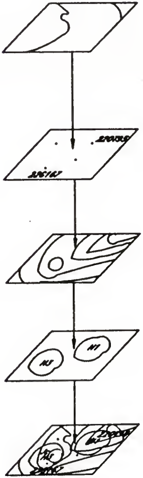


$$\boxed{h = H + N}$$

h	ELLIPSOIDAL HEIGHT
H	HEIGHT ABOVE GEOID (~ ORTHOMETRIC HEIGHT)
N	GEOID SEPARATION


Number SVs and PDOP
Point: Denver
Date: Monday, January 30, 1995
Lat 38:58:0 N Lon 105:41:0 W
Threshold Elevation 15 (deg)
Ephemeris: CURRENT.EPH 1/13/95
Time Zone 'Mountain Std USA' -7
25 Satellites considered : 1 2 4 5 6 7 9 12 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 31
Nsats
12
8
4
0
PDOP
20
16
12
8
4
0
7:00
9:00
11:00
13:00
15:00
17:00
Time: Major tick marks = 2 .ours. (Sampling 10 Minutes)

GEOGRAPHIC INFORMATION SYSTEM (GIS)



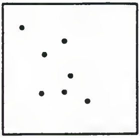
MAP LAYER	LAND DATA	RECORD FORMAT	ATTRIBUTE TABLES
	ROADS	LINE	60–100
	GEOTECH POINT DATA SPECIFIC SOIL & WATER DATA	POINT	12–25
	CONTOUR LINES	LINE	1–5
	MANAGEMENT PROPOSAL AREAS	POLYGON/ AREA	27–59
	DESIRED MAP PRODUCT		

Spatial Objects or Features

Spatial objects are geographic features that can be described on a map. These objects, usually referred to as features, are classified into three data types: points, lines, and polygons. (Polygons are also called areas, regions, or boundaries.) A feature can have only one data type.

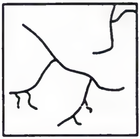
Points

A point has no area; it is zero-dimensional. A point is used to represent features for which only one geographic location (such as latitude-longitude) is needed. Point features can include nest sites, well sites, and utility poles.



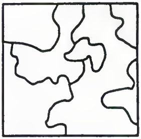
Lines

A line is made up of a series of connected points. It is one-dimensional; it has length but no width. Line features can include streams, roads, and animal trails.



Polygons (Areas)

A polygon is an area enclosed by lines. It is two-dimensional; the area enclosed by a polygon has length and width. Polygon features may include areas of common soil types, regions of timber sales, and wetlands.



DATA DICTIONARY

A catalog of information about the definition, structure and usage of data.

PATHFINDER DATA DICTIONARY

A file which contains details about the kinds of data to be collected during a project or job, and consists of the following elements:

1. **A list of features**
2. **For each "feature" - a list of attributes** (if any)
3. **For each "attribute" - a list of values** (if any)

FEATURES

A feature is a physical thing, or the site of some event or phenomenon (e.g., a tree, a road, a parcel of land).

There are three types of features:

1. "point feature" (e.g., a tree)
2. "line feature" (e.g., a road)
3. "area-polygon-features"
   (e.g., a parcel of land)

ATTRIBUTES

An attribute is a description, or characteristic of a feature.

An example for a tree feature could include the following "attributes":

- height
- diameter
- species
- age
- condition (diseased?)
- other physical characteristics

ATTRIBUTE VALUE

An attribute value is a list of all possible values (the domain) for an attribute.

attribute = "species" / the "attribute value":

☞ Douglas Fir

☞ Sitka Spruce

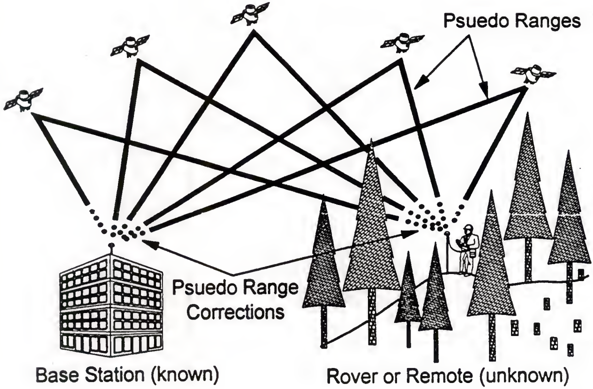
☞ Ponderosa Pine

attribute = "condition" / the "attribute value":

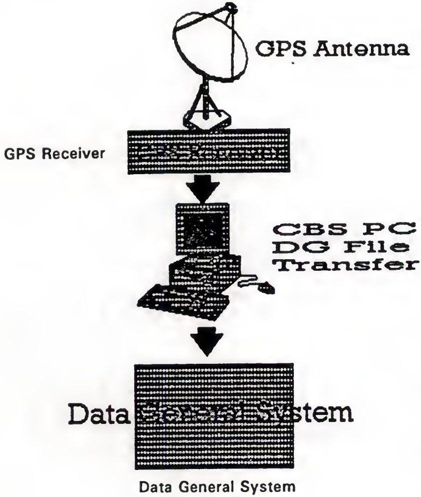
☞ good

☞ poor

Differential Correction



Community Base Station



Community Base Station
Data Sheet

Portland CBS

Contact:Ken Chamberlain FS, Ken Bays BLM
Agency:USFS Pacific Northwest Region / BLM Oregon State Office
-DG:R06C
-Phone:FS 503-326-2921; BLM 503-
952-6135

Position:
-Datum:WGS-84
-Latitude:45-31-12.297N
-Longitude:122-40-22.927W
-Height Above Ellipsoid:35.13 meters

Parameters:
-Data Logging: Positions 5 sec. and Measurements 5 sec.
-SNR Mask:6
-Elevation Mask:10
-PDOP Mask:8
-PDOP Switch:12

Operation hours:24 hrs/ 7 days/week
File transfer time: 1800-1815 local

Data Access:
-Filename:PYMMDDHH.EXE: Where; P=Portland; Y=Year; MM=Month; DD=Day, & HH=Hour in GPS time; .EXE files are compressed and self-extracting.
-File length:1 hour
-File storage: 2 weeks minimum.

DG:Yes
DG Path: :R06C:STAFF:LM:SURVEYS:PBASE:(filename)

-BBS:Yes (Non USFS users only)
-Data Line:503-326-2796
-Settings:N-8-1

Notes:

Base File Naming

PYMMDDHH.EXE

- P = Portland (CBS Location Code)
- Y = Year
- MM = Month
- DD = Day
- HH = Hour (GPS Time)
- .EXE = Self-Extracting file
- EG: P3021020.EXE

GPS RELATED BULLETIN BOARDS

☞ **U.S. Coast Guard Information Center**

Phone: (703) 313-5910
Baud rate: 2400
Parity: none
Data bits: 8
Stop bits: 1

☞ **Trimble Navigation**

Phone: (408) 732-6717
Baud rate: 2400 (higher speeds also available)
Parity: none
Data bits: 8
Stop bits: 1

BLM, Cadastral Survey - GPS Contacts

SG = Survey Grade

RG = Resource Grade

State	Name	Address	Tel/Fax	Email
Alaska	Joe Burns (SG)	222 W. 7th Ave., #13 Anchorage, AK 99513	T:907-267-1403 F:907-267-1250	
	Dale Sherba (RG)		T:907-271-3559 F:907-271-5223	
Arizona	Dean Weise (both)	P.O. Box 16380 Phoenix, AZ 85011	T:602-265-7591 F:602-264-5331	
California	Ignacio Lopez (both)	2800 Cottage Way Sacremento, CA	T:916-979-2890 F:916-978-2874	!ilopez
Colorado	Carl Nagy (SG) MaryBeth Broe(RG) Randy Bloom (SG)	2850 Youngfiels St. Lakewood, CO 80215	T:303-239-3851/3830 F:303-239-3815	
Eastern States	Mike Young (SG) Jerry Wahl (both)	7450 Boston Blvd. Springfield, VA 22153	T:703-440-1688 F:703-440-1687	
Idaho	Tim Geary (both)	3380 Americana Ter. Boise, ID 83706	T:208-384-3134 F:208-384-3100	
Montana	Mike Harbin (both)	P.O. Box 36800 Billings, MT 59107	T:406-255-2709 F:406-255-2968	
Nevada	Mary Hartel (SG) Bruce Piper (both)	850 Harvard Way P.O. Box 12000 Reno, NV 89520	T:702-785-6541 F:702-785-6411	!mhartel
New Mexico	Jay Innes (both)	P.O. Box 27115 Sante Fe, NM 87502	T:505-438-7490 F:505-438-7843	
Oregon	Ken Bays (both)	P.O. Box 2965 Portland, OR 97208	T:503-952-6135 F:503-952-6190	!kbays
Utah	Karla Garison(RG) John Larsen (RG) Don Buhler (SG)	324 S. State St., Suite 301 SLC, UT 84111	T:801-539-4146 F:801-539-4146 T:801-539-4143 T:801-539-4135	
Wyoming	Mike Londe	P.O. Box 1828 Cheyenne, WY 82003	T:307-775-6209 F:307-775-6173	!mlonde

REPORT ON THE DEMONSTRATION OF FAST STATIC GPS SURVEY
EUGENE, OREGON OCTOBER 7, 1993

The following is a comparison of the results of the demonstration of fast static GPS surveying and the conventional traverse preformed by Rick McMullen over the same course.

STATION	GPS	TRAVERSE	DIFFERENCE
A			
BEARING	N 28 04 10 E	N 28 04 31 E	21" CLOCKWISE
DISTANCE	1022.42 ft.	1022.43 ft.	0.01 ft.
B			
BEARING	S 09 25 57 E	S 09 25 33 E	24" CLOCKWISE
DISTANCE	1402.62 ft.	1402.65 ft.	0.03 ft.
C			
BEARING	N 55 53 34 W	N 55 53 10 W	24" CLOCKWISE
DISTANCE	858.68 ft.	858.68 ft.	0.00 ft.
A			
CLOSURES	N = 0.004 ft. E = 0.001 ft. U = 0.032 ft.	N = 0.040 ft. E = 0.006 ft. NONE	

The GPS field work was completed in two 8 minute sessions. Adding setup and breakdown time would bring the total time required for the field work to approximately 30 minutes (access time not included). The same time would be required if the stations were several miles apart with trees, mountains, rivers, or canyons in between.

Both the traverse and the GPS survey were adjusted by the least squares method. The traverse was adjusted using "CMM". The GPS data was adjusted using "Geolab2". The basis of bearing for the traverse was a solar observation made on September 30, 1993 by Rick McMullen. The GPS bearings are from raw data without the benefit of adjustment to control stations as is the normal practice. While the bearings do differ significantly the integrity of the relative angles was maintained with amazing accuracy.

GPS / GIS

HOW

TO

BEGIN

The Integrating Vessel

Geographic Information Systems (GIS)

Data Base Integrator

*** DBMSINFO/ INFODBMS**

*** DBMSEXECUTE**

The Integrating Vessel

Geographic Information Systems (GIS)

Image Integrator

* ERDAS/Imagine [Plus]

* CONVERTIMAGE

* GRIDIMAGE/IMAGEGRID

* RECTIFY

* REGISTER

*ADDIMAGE

* IMAGE/IMAGEVIEW

Traditional Data Sources

Tools for managing the location of Archeological Sites upon their discovery.

- The 7.5' Quadrangle Map.
- A 9"X9" B&W aerial photo.

In the field

Source	Scale	Use and skill required
Quad	1:24,000	Navigation, orientation, & recording location. Much skill.
Photo	1:80,000 or 10,000 etc.	Navigation, orientation, & recording location. Much skill.

Traditional Data Sources

Tools for managing the location of Archeological Sites upon their discovery.

- An automated database.
- Paper site records.

In the office

Source	Owner	Use and skill required
dBaseIII	Variable	Printouts or interactive. Much skill and time. Laborious.
Paper	Duplicates not always consistent.	File drawers, and filing. Loss possible without skill and diligence.

GPS/GIS

PRE-PROCESSING

Where is “The Massey Draw Site”?

What major physical features are identifiable to lead us to the site?

Resources:

Quadrangle

Scaler

UTM/Geographic coordinates

Air photo

Cadastral notes

Integrating/Relating Technologies

Current BLM S/W and H/W provides an environment that allows integrating RDBMS, Remote Sensing, and GPS through GIS.

Integration possibilities

System	Issue	Required action
RDBMS	Table structure	Examine schema including values for catagrories of information that are required that are related to other systems
REMOTE SENSING	Sources, types, registration - (scales?/resolution)	Choosing correctly for the task at hand. IR, B&W, etc... Accessioning formats to the system to be used. Scanning and image processing.
GPS	Data Dictionary, Parameters, NAD, Projection, etc..	Set up data dictionary to reflect compatiblity with other systems

Instructions for Form Use.

Observer: The person recording the data.
Agency and Office: Yes, we do want to know who you are, and where to contact you!

Date: The date you made your field visit. This could be important, especially in regard to vegetation phenology at the time you made your data colletction, versus the satellite acquisition date.

Point ID #: This should be a number consisting of the observer's initials, and three numbers denoting your sample, in consecutive order. For example, the first point collected by Allen Cook would be: aec001. **Note:** This name can also be used as your GPS filename, thus keeping data together, and minimizing confusion later.

Watershed: What watershed are you collecting data for? Please use the watershed hydrologic unit number, which will be part of the title in the upper right corner of the field plot you are checking.

Photo Taken: Did you take a Polaroid shot of the sample site? Please attatch to the form.

UTM X and Y: Universal Transverse Mercator Coordinates (in Meters) derived either from GPS equipment or from a plastic grid and a topo map (1:24000 or 1:100000). GPS coordinates are **strongly** prefered. Note the zone and datum, this will be in the lower-left corner of the topo map, or provided by your GPS equipment. (We prefer zone 13 and NAD27). Be sure to check the appropriate box if you used GPS equipment to determine your location. The corrected position is where you enter the corrected GPS position you will get when you download and post-process your GPS data. This information is important, since it gives much more accurate position information, so we can tell where you were! **Alternatively**, you can record your position in latitude, longitude, if that is the only means you have. This might be the case if you are in the field with one of the older GPS units. In this case, you should fill in the UTM position later, after you have post-processed the data.

Elevation: Obvious, but be sure your GPS unit is set to record above mean sea level (MSL), not height above ellipsoid (HAE).

Area Size: Simply an estimate of the place you are measuring. You can compare the field site to the polygon on the plot, or to the aerial photography you may be using.

Slope and Aspect: Self explanitory.

Major Lifeform: Refer to the classification hierarchy we are using. This may not be a canopy dominant, as in sparse Piñon/Juniper with a grass understory.

Vegetation Distribution: This is to help us visualize the site. For example, does the riparian zone consist of clumps of cottonwoods along a stream course, or is it a continuous strip of cottonwoods?

Density: Check the appropriate box. You need not total 100%.

Dominant Group(s): Refer to the classification hierarchy, and give the three dominants, including non-vegetated categories.

Dominant Series: As above, but refer to the series level. Use the SCS genus/species coding convention.

Remote Sensing Ground Truth Field Data Form - Southwest Colorado Vegetation Classification Project

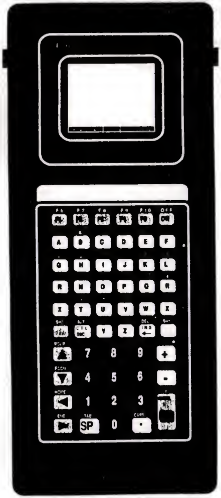
Observer:	Agency and Office:
Date:	Point ID #:
Watershed code #:	Photo taken? ☐ Yes ☐No
UTM X: Corrected X: UTM Y: Corrected Y: Zone: ☐12 ☐13 GPS Location? ☐ Yes ☐ No* Datum: ☐ NAD27 ☐ WGS84 ☐ NAD83	Latitude: Longitude:
Elevation: ☐ Feet ☐ Meters (MSL) From: ☐ Topo ☐ GPS	Slope: ☐ Flat 0 - 5% ☐ Moderate 6 - 20% ☐ Moderately steep 21 - 40% ☐ Steep 41 % or more
Area Size: ☐1.5 - 3 Acres** ☐ 3.1 - 5 Acres ☐ 5.1 - 10 Acres ☐ 10 Acres or more	Aspect: ☐ N ☐ NE ☐ S ☐ NW ☐ E ☐ SE ☐ W ☐ SW
Major Lifeform: ☐ Tree ☐ Shrub ☐ Grassland ☐ Barren ☐ Water ☐ Other______	Vegetation Distribution Dominant Group ☐ patchy ☐ continous 2nd Dom. Group ☐ patchy ☐ continous
Dominant Group: Primary Series: Secondary Series:	Group Cover: ☐ 0 - 5% ☐ 50 - 75% ☐ 5 - 25% ☐ 75 - 95% ☐ 25 - 50% ☐ 95 - 100%
Second Dominant Group: Primary Series: Secondary Series:	Group Cover: ☐ 0 - 5% ☐ 50 - 75% ☐ 5 - 25% ☐ 75 - 95% ☐ 25 - 50% ☐ 95 - 100%
Tertiary Group: Primary Series: Secondary Series:	Group Cover: ☐ 0 - 5% ☐ 50 - 75% ☐ 5 - 25% ☐ 75 - 95% ☐ 25 - 50% ☐ 95 - 100%
General Description of Area:	Comments:

BLM Service Center - Version 2 - 9/20/94 fieldform.aw

* Use of GPS is strongly prefered. If GPS equipment is unavailable, you should select only larger areas for sample sites. Areas of 500 meters (1640 ft.) square are only .2 inches at 1:100000 scale, therefore, it is recommended to measure only areas larger than 500 meters. This will avoid locational errors in determining field location. Keep in mind that 1:24000 scale plots can be produced for areas you wish to study intensively.

** Use of an area smaller than 3 acres is inappropriate for mapping at 1:100,000 scale. Pick a larger area to sample.

Soft Keys and Special Keyboard Functions



- The bottom line of the screen displays up to five soft keys, each of which may be selected by pressing the corresponding function key (labeled **F1** to **F5**).
- Press **SH2** followed by another key in order to obtain the special character or function illustrated.
- To review (edit) a file, press the **SH2** key and then the **F7** key.
- To enter a note in the current file, press the **SH2** key and then the **F8** key.
- To warm boot the MC-V, hold down the **F3** key, press and release the **On/Off** key, and then release the **F3** key.

Data Entry

- Use ↑ and ↓ to move around and highlight fields.
- Press **SH2** and then ← or → to move to the top or bottom.
- Press **SH2** and then ↑ or ↓ to move up or down a page at a time.
- Key in appropriate values and then press **Enter** to accept the data and move to the next field.
- **SH2** **CAPS** switches between upper and lower case for subsequent letters. **SH1** switches between upper and lower case for the next letter only.
- Use these options to enter a new value or edit an existing one:
  - Type the characters into the highlighted field, then press **Enter**.
  - Press → or ← when the field is highlighted, to move to the start or end of the field respectively and to enable editing.
  - Press **Enter** when a menu field (☐) is highlighted, to display a pop-up menu. Use ↑ and ↓ to move the highlight bar to the required option in the menu and press **Enter** or press the first letter of the required option to select it. If there is more than one option beginning with the same letter, repeatedly press the letter until the desired option is highlighted and press **Enter** to select it.
- Press the **F5** key (OK) when all fields have acceptable values. The Asset Surveyor will verify that the entered data is correct, and then proceed to the next operation. If you do not wish to continue or accept the values entered, press **ESC**.

Trimble

Surveying & Mapping Division
645 North Mary Avenue
Post Office Box 3642
Sunnyvale, CA 94088-3642
1-800-827-8000 in North America
1-408-481-8000 International
FAX: +1-408-481-8214

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Asset Surveyor™

GIS Data Acquistion Field Computer

Quick Reference Card

March 1994
Part Number 23394-00

Version 2.50 for the MC-V®

Main Menu

Press On *to turn your Asset Surveyor on and attempt to connect to your GPS receiver.*

Main

Data capture
Capture data in the field and maintain data files.

Navigation
Navigate between waypoints.

File transfer
Transfer files, waypoints and data dictionaries between your MC-V and PC.

Utilities
Display menu for waypoint maintenance, printing reports and checking external sensors.

Base station
Operate as a base station for a Pathfinder™ GPS receiver.

Info for new users
Display essential information for new users.

GPS Menu

Press the SH2 *key and then the* F6 *key to display the GPS menu.*

GPS Operations

Position
Display the current position.

Receiver status
Display GPS receiver status. (2 pages)

Satellite info
Display information on each satellite. (1-2 pages)

Navigation
Navigate between waypoints.

Waypoints
Maintain the waypoint library.

2D altitude
Enter an altitude for 2D mode.

Disconnect
Explicitly disconnect GPS.

Configuration Menu

Press the SH2 *key and then the* F9 *key to display the Configuration menu.*

Configuration

GPS INIT POS
Change logging intervals, masks, etc. (3 pages)

Coordinate system
Maintain library of coordinate systems.

Units and display
Choose units and other display options. (3 pages)

Time and date
Set current time and date.

Quickmark
Define options for quickmarks.

External sensor
Specify external sensor parameters. (3 pages)

Hardware (MC-V)
Check MC-V hardware parameters. (2 pages)

Printer
Configure printer comms.

Soft Keys

Data Capture

CREAT
Create a new file.

STATS
Display file statistics.

DEL
Delete selected file.

DICT
Select data dictionary.

PAUSE
Pause GPS logging.

RESUM
Resume GPS logging.

REPEA
Repeat selected feature.

QUICK
Quickmark a feature.

NEST
Nest a point feature.

SEG
Segment a line feature.

EXT
Activate external sensor.

Navigation

NAV1
Navigation screen 1.

NAV2
Navigation screen 2.

NAV3
Navigation screen 3.

START
Select start waypoint.

END
Select end waypoint.

Waypoints

CREAT
Create new waypoint.

MEASU
Measure between waypoints.

DEL
Delete selected waypoint.

CLEAR
Delete ALL waypoints.

EDIT
Edit selected waypoint.

PREV
Pick previous waypoint.

NEXT
Pick next waypoint.

STEP
Step to next waypoint.

Coordinate System

CREAT
Create new item.

DATUM
Maintain datums.

DEL
Delete current item.

EDIT
Edit current item.

File Review

SEARC
Search for given text.

POS
Display feature's position.

DEL
Delete feature or note.

UNDEL
Cancel deletion.

External Sensor

READ
Read from sensor.

STATUS
Display sensor status.

COMMS
Configure sensor comms.

General

INFO
Helpful information.

SETUP
Configuration.

HERE
Current GPS position.

WAYPT
Create or select a waypoint.

UNKNO
Unknown reference position.

RTCM
Configure RTCM comms.

DECIM
Configure decimeter mode.

ANTENNA
Configure antenna details.

UNITS
Display choice of units.

SYMB
Enter special character.

ALL
Log at maximum rate.

NONE
Do not log at all.

NULL
Enter 'unknown' value.

AUTO
Compute automatically.

GPS/GIS
How to begin

Begin with the end in mind.

The first steps in the use of GPS/GIS is to consider your purpose. Why are you coming to this technology?

The concept of "Mapping Systems" is central to why we involve ourselves with GPS/GIS but there is more to it if you think only of this technology as automated cartography. These are spatial analytical systems. Maps show relationships among features, but what features are you considering? Water, slope, forests, archaeological sites, or transportation routes are some features that might be shown and related to one another. But taking the "water" feature, what about water on the map? Are you concerned with rate of flow, salinity, turbidity, springs, rivers, wells? This "water" is the stuff of a geo-referenced x,y,z coordinates as lines, points, polygons (or cells), but also of data base management or the "attributes" associated with the mapped feature water.

The first step for the person wishing to apply GPS/GIS to their work is to identify the feature class or theme (a general category) of spatial data of interest. Choosing the features Archaeological site locations across the landscape is part of the process, but as an archaeologist I am interested in more than merely the location of the site. What attributes about sites shall I collect?

An archeologist will first consider the current research/management objective for this particular collection effort. Next, to guide one's choices of what attributes to collect, review existing information about sites. Especially, what automated information is currently being collected and maintained? Of that data, what might be observable in the trip to the field? Let's take a look at some site record items that might interest an archeologist as represented on a site form.

1) Document Type (report, monograph, or book - title in edited collection - manuscript - volume in report series, article in journal - article in magazine)

2) Total Area Surveyed:_______________ acres

3) Standard Survey Interval: ___________ meters

4) Standard Crew Size: ___________

Many site forms will present over 100 data dictionary items. Prior to planning a GPS/GIS data collection effort **review** any extant **data**

dictionaries and the **data format**. This will be the basis of building your data dictionary in PFINDER (or other GPS data collecting software).

In this course the Indian Hills Sites (IHSITES) Data Dictionary was drawn from the schema of the New Mexico State Historic Preservation Officer's (SHPO) New Mexico Cultural Resource Information System (NMCRIS), but populated from the Colorado State Historic Presevation Officer's data base. The Colorado SHPO is not currently using a relational DBMS.

For the course we will continue to follow the conventions of the NMCRIS Data Dictionary. Remember, first to focus on the management or research question/problem that you will deal with. See the ***Land Management situation/problem***.

From that senario what attributes of the site in question would you wish to collect? Do these attributes exist in the *NMCRIS Data Dictionary*? What attributes from NMCRIS ought you collect because they relate to the GPS attributes that you will collect?

NCRS Data Dictionary

Column ID & Name	Keys	Data Type	Data Length	Data Precis.	Data Scale	Null-able?	Unique ?
17 LAST_RECORD_VERIFICATION_DATE Description: Last Record Verification Date		DATE	7			X	
18 RECORD_UPDATE_COUNT Description: Record Update Count		NUMBER	22				
19 LAST_RECORD_UPDATE_DATE Description: Last Record Update Date		DATE	7			X	
OPS$NMCRIS.ARCH_SITE_DOE_EDIT_HISTORY (Edit History Table)							
1 ARCH_SITE_NUM Description: Archeological Site Number Foreign Key: ARCH_SITE_DOE.ARCH_SITE_NUM (w/ RECORD_CREATION	P RR	NUMBER	22				
2 RECORD_CREATION_DATE Description: Record Creation Date Foreign Key: ARCH_SITE_DOE. RECORD_CREATION DATE (w/	P RR	DATE	7				
3 UPDATE_NUM Description: Update Number	P	NUMBER	22				
4 UPDATE_DATE Description: Update Date		DATE	7				
5 UPDATING_USER_NUM Description: Updating User Number Foreign Key: USER_PRIVILEGES.USER_NUM	R	NUMBER	22				
6 UPDATE_DESC Description: Update Description		CHAR	255			X	
OPS$NMCRIS.ARCH_SITE_EDIT_HISTORY (Edit History Table)							
1 ARCH_SITE_NUM Description: Archeological Site Number Foreign Key: ARCH_SITE.ARCH_SITE_NUM	P R	NUMBER	22				
2 UPDATE_NUM Description: Update Number	P	NUMBER	22				
3 UPDATE_DATE Description: Update Date		DATE	7				
4 UPDATING_USER_NUM Description: Updating User Number Foreign Key: USER_PRIVILEGES.USER_NUM	R	NUMBER	22				
5 UPDATE_DESC Description: Update Description		CHAR	255			X	
OPS$NMCRIS.ARCH_SITE_FEATURE (Data Table)							
☐ - 1 ARCH_SITE_NUM * Description: Archeological Site Number Foreign Key: ARCH_SITE.ARCH_SITE_NUM	R	NUMBER	22				
2 FEATURE_TYPE_CODE * Description: "Feature Type" {p. 4-26} Foreign Key: ARCH_FEATURE_CODE.FEATURE_TYPE_CODE	R	NUMBER	22			X	
☐ 3 OTHER_FEATURE_TYPE_DESC * Description: "Feature Type: other" {p. 4-26}		CHAR	35			X	
4 RELIABLE_ID_FLG * Description: "Reliability of ID" {p. 4-26}		CHAR	1			X	
5 NO_OBSERVED * Description: "Number of Observed Features" {p. 4-26}		NUMBER	22	3	0	X	
6 COMPONENT_NUM_LIST * Description: "Associated Components" {p. 4-27}		CHAR	255			X	

Keys: P = Primary R = Foreign Description: {NMCRIS User's Guide page ref.}; * = used in Remote Data Entry Program

NCRS Data Dictionary

Column ID & Name	Keys	Data Type	Data Length	Data Precis.	Data Scale	Null-able?	Unique ?
7 FEATURE_NOTES_DESC * Description: "Feature ID, Notes" {p. 4-27}		CHAR	60			X	

OPS$NMCRIS.ARCH_SITE_FEAT_REMARKS (Data Table)

1 ARCH_SITE_NUM * Description: Archeological Site Number Foreign Key: ARCH_SITE.ARCH_SITE_NUM	P R	NUMBER	22				
2 FEATURE_REMARKS_DESC * Description: "Feature Remarks" {p. 4-27}		CHAR	255				

OPS$NMCRIS.ARCH_SITE_INV_COMMENTS (Records Inventory Table)

1 ARCH_SITE_NUM Description: Archeological Site Number Foreign Key: ARCH_SITE.ARCH_SITE_NUM	P R	NUMBER	22				
2 COMMENTS Description: Comments		CHAR	255				

OPS$NMCRIS.ARCH_SITE_LINK (Link Table)

1 ARCH_SITE_NUM * Description: Archeological Site Number Foreign Key: ARCH_SITE.ARCH_SITE_NUM	P R	NUMBER	22				
2 ACTIVITY_NUM * Description: Activity Number Foreign Key: ACTIVITY.ACTIVITY_NUM	P R	NUMBER	22				

OPS$NMCRIS.ARCH_SITE_LOCATION (Data Table)

1 ARCH SITE_NUM * Description: Archeological Site Number Foreign Key: ARCH_SITE.ARCH_SITE_NUM	P R	NUMBER	22				
2 USGS_75_TOPO_SGRAPHIC_FLG * Description: "Source Graphics" {p. 4-11}		CHAR	1			X	
3 OTHER_TOPO_SGRAPHIC_DESC * Description: "Source Graphics" {p. 4-11}		CHAR	60			X	
4 RECT_AERIAL_SGRAPHIC_DESC * Description: "Source Graphics" {p. 4-11}		CHAR	60			X	
5 UNRECT_AERIAL_SGRAPHIC_DESC * Description: "Source Graphics" {p. 4-11}		CHAR	60			X	
6 GPS_SGRAPHIC_FLG * Description: "Source Graphics" {p. 4-11}		CHAR	1			X	
7 OTHER_SGRAPHIC_DESC * Description: "Source Graphics" {p. 4-11}		CHAR	60			X	
8 UTM_ZONE * Description: "Zone" {p. 4-12}		NUMBER	22			X	
9 UTM_EASTING * Description: "Easting" {p. 4-12}		NUMBER	22			X	
10 UTM_NORTHING * Description: "Northing" {p. 4-12}		NUMBER	22			X	
11 TOWN * Description: "Town" {p. 4-14}		CHAR	35			X	
12 NEAREST_DRAINAGE * Description: "Nearest Named Drainage" {p. 4-13}		CHAR	60			X	

Keys: P = Primary R = Foreign Description: (NMCRIS User's Guide page ref.); * = used in Remote Data Entry Program

Associated Phase/Complex Names: When available information allows the component to be associated with one or more published archeological complexes or phases (e.g., Cody Complex, Panhandle Aspect, Doña Ana Phase, Red Mesa Phase), enter those name(s) in the provided space using the list of published phase and complex names in Appendix 6 as a guide. If a specific phase or complex does not appear in Appendix 6, enter the name and document the sources in **Observations on Cultural/Temporal Affiliations**. If the site component has no firm archeological phase or complex associations, or if **Culture** is unknown, leave this data item blank.

10. FEATURE DATA

As outlined in Chapter 2 (**Design Rationale**), archeological features consist of structures, facilities, and other cultural remains observed within a site. In NMCRIS, feature data are entered in an inventory table. Features should be described with an amount of detail appropriate to the nature of the physical data and the recording circumstances. Depending on the intensity of field observations, features can be described as uninterpreted remains (e.g., a charcoal stain, a rubble mound), or as interpreted feature types (e.g., a hearth, a roasting pit, a roomblock). In addition, features may be identified and described individually (e.g., roomblock #1, hearth #5) or in groups with a count (e.g., 3 roomblocks, 5 hearths) depending on the intensity of field recording. An extensive list of standard feature types is provided in Appendix 7, but new types may be added by the field archeologist. Space is provided for a brief feature description and an assessment of reliability of the feature identification. Features may be related to multiple site components or, if associations are uncertain, to *no* site component, without distorting the site's total feature count in the inventory.

Inventory all archeological features observed on the site. Feature Continuation Sheets (see Appendix 1) should be attached, if required. Data items in the inventory table are described below:

Feature Type: Enter the type of feature. Use the list of defined feature types in Appendix 7 as a guide, but if an appropriate type does not appear in that list, *do not hesitate to enter a new feature type in this field.* If a new feature type is entered in the inventory, include a description in **Feature ID, Notes** and/or **Feature Remarks**.

*Note: Assemblage characteristics such as lithic scatters, ceramic scatters, and fire-cracked rock scatters are **not** entered in Feature Data -- these materials are entered under **Assemblage Data**.*

☐

Reliability of ID: If the identification of a feature is questionable, enter a question mark ("?") in this field. Depending on the circumstances, a shallow depression could be entered as a pithouse with a questionable identification or, simply, as a depression.

☐

Number of Observed Features: Enter "1" for all features entered individually. For groups of one feature type, enter the total number of that type observed on the site (e.g., 5 hearths, 2 roomblocks). If actual counts are not possible, enter an estimate in the **Feature Remarks** data item and indicate how that estimate was derived.

Associated Components: List the component numbers from Section 9 (**Cultural/Temporal Affiliations**) of the LA Site Record that are associated with each individual feature or feature group. Enter zero ("0") if the relationship between components and features is not known. Several examples illustrate how to complete this data item:

Example #1: LA 12345 consists of two components: #1 (Anasazi-Pueblo II Period), and #2 (Anasazi-Pueblo IV Period). If Roomblock #1 on this site was occupied during Component #1, abandoned, and then reoccupied during Component #2, enter "1, 2" in **Associated Components** (i.e., the roomblock is associated with *both* components).

Example #2: LA 56789 consists of two components: #1 (Archaic-Late Archaic Period), and #2 (Anasazi-Basketmaker II Period). If the three hearths present on the site cannot confidently be associated with either Component #1 or Component #2, enter zero ("0") in **Associated Components** (i.e., the hearth cannot be positively associated with *either* component; feature-component associations are not known).

Example #3: LA 33445 consists of two components: #1 (Archaic-Late Archaic Period), and #2 (Navajo-Recent Period). To indicate that 3 hearths are associated with Component #1 enter "1" in **Associated Components**. Similarly, enter "2" in **Associated Components** to indicate that Hogan #3 is associated with Component #2.

☐ **Feature ID, Notes:** This field may be used to enter two kinds of feature information:

1. Individual feature identifications may be entered to relate the feature to detailed narrative descriptions elsewhere on the form, or to site maps (e.g., Feature #1, Hearth #13, Roomblock C).

2. Brief descriptive notes on feature size, shape, construction methods or materials, etc., may be entered (e.g., pithouse depression: "6 m diam., 0.4 m deep", room block: "masonry, 50 rooms", roasting pit: "1.3 m x 1.9 m w/ intense staining"). Multiple lines may be used, but very detailed descriptions should be entered under **Feature Remarks** or in the **Narrative Site Description**. If multiple lines are used, leave a blank line between descriptions.

☐ **Feature Remarks:** Provide your best assessment of the data potential of the features, e.g., are hearths eroded or do they have remaining intact deposits? Discuss in detail the spatial distribution of inventoried site features, their construction details and size, associated material culture, and any circumstances that may have affected field observations (e.g., the ground was wet, recording time was limited). Also explicitly identify and explain any estimated frequencies that were provided in the feature inventory.

11. REFERENCES

Written Sources of Information: Document any additional written materials resulting from your work at the site. Please provide *American Antiquity*

Forked Stick Hogan: A conical Navajo dwelling with a central forked log support. Logs are leaned against the central support and covered with brush and earth. Validation: historic components only. Related features: **Hogan, Sweat Lodge, Wickiup.**

Game Pit/Trap: All passive hunting phenomena including drop sites, deadfalls, snares, dead end traps, and beating corridors. Related features: **Cairn, Depression, Undefined Rock Alignment, Wall.**

Garden Plot/Grid Garden: Small, formal agricultural areas, often bounded with cobbles and containing gravel mulch. Validation: historic and prehistoric ceramic components only. Related features: **Agricultural Field, Soil Control Structure, Water Control Device.**

Graffiti: Markings or writings, usually crude, made upon a surface. Use for *tree art* or *aspen art* as well as modern additions to rock art if those additions are considered part of a site component. Validation: historic components only. Related features: **Petroglyph and Pictograph.**

Grain Mill: A structure originally equipped with machinery for the processing by grinding or crushing of grains. Validation: historic components only. Related features: **Sawmill.**

Great Kiva: *Large* kiva. *Big* kiva. *Gigantic* kiva. Validation: prehistoric ceramic components only. Related features: **Depression, Kiva, Pithouse.**

Hearth: An extramural, localized area of controlled intentional burning. Encompasses all surficial fire-related phenomena including fire pits, formal hearths, unstructured hearths, fire rings, burned rock rings, fire deflectors, and slab-lined hearths. Hearth does not include standing fireplaces or chimney remnants. Such items should be entered as part of a House Foundation. Related features: **Ash Stain, Burned Rock Midden, Charcoal Stain, Horno/Oven, Mescal Pit, Pottery Kiln, Ring Midden, Roasting Pit, Sweat Lodge.**

Hogan: A Navajo dwelling, usually round or later octagonal. Includes masonry, cribbed log and framed structures. Use for hogan foundations and deteriorating hogans as well as standing hogans. Validation: historic components only. Related features: **Forked-Stick Hogan, Stone Circle, Tipi Ring, Wickiup.**

Horno/Oven: An enclosed space used to heat objects placed within its bounds. Includes earth ovens, oven pits, mud ovens, and bread ovens. Related features: **Brick Kiln, Coke Oven, Hearth, Kiln, Lime Kiln, Mescal Pit, Pottery Kiln, Roasting Pit.**

House Extant: A habitation structure. Use for standing structures, especially if presently occupied. Validation: historic components only. Related features: **Fired Brick Structure, House Foundation, Isolated Room, Log Cabin, Milled Lumber Structure, Roomblock.**

House Foundation: The remains of a habitation structure, including collapsed buildings. Includes footings of various materials, formal house cellars, cement slabs, builders trenches, and crawl spaces. Validation: historic components only. Related features: **Mound, Isolated Room, Roomblock, Undefined Rock Alignment, Wall.**

Irrigation Ditch/System: A ditch or interrelated group of ditches/acequias, head gates, and drains that constitute a irrigation system for individual watering and irrigation features. Validation: historic and prehistoric ceramic components only. Related features: **Water Control Device, Water Catchment Device.**

Orchard: An area of land devoted to the cultivation of fruit or nut trees. Validation: historic components only. Related features: **Agricultural Field, Garden Plot/Grid Garden.**

Ore Processing Facility: Ore mill structures and abandoned machinery (e.g., concentrators, ball and stamp mills, conveyor belts, leaching vats). Related features: **Mine Shaft/Tunnel, Mine Waste, Ore Transport Feature.**

Ore Transport Feature: Structures and features associated with the transport of ore (or coal) from mine to mill to final shipping by truck or rail (e.g., headframes, hoist machinery and housing, flumes, loadouts, trams). Validation: historic components only. Related features: **Bridge, Mine Shaft/Tunnel, Mine Waste, Ore Processing Facility, Railroad Tracks/Bed, Road/Trail.**

Outbuilding: Structures separated from, but related to, the principal structure on an residential site. Includes chicken coops, storage buildings, well houses, etc. Describe construction materials in **Feature ID, Notes** or **Feature Remarks.** Validation: historic components only. Related features: **Barn, Dugout, Fired Brick Structure, Isolated Room, Milled Lumber Structure, Outhouse, Ramada/Shelter, Shed.**

Outhouse: A small structure housing an outdoor toilet, or the remains of such a structure. Validation: historic components only. Related features: **Barn, Dugout, Fired Brick Structure, Depression, Isolated Room, Milled Lumber Structure, Outbuilding, Ramada/Shelter, Shed.**

Petroglyph: A design scratched, pecked, or scraped into a rock surface. Related features: **Graffiti, Pictograph.**

Pictograph: A design drawn in pigment upon an unprepared or ground rock surface. Related features: **Graffiti, Petroglyph.**

Pithouse: A habitation structure built entirely or partially underground. Related features: **Depression, Dugout, Great Kiva, Kiva.**

Plaza: An open area which may be partially or completely enclosed by structural remains (standing or collapsed), used for community activities. May contain temporary structures (e.g. sun shades or ramadas) as well as special activity areas (milling bins, hearths). Validation: historic and prehistoric ceramic components only. Related features: **Church/Religious Structure, Great Kiva, Kiva, Ramada/Shelter, Roomblock, Tower.**

Pottery Kiln: An oven or heated enclosed space for firing pottery. Validation: historic and prehistoric ceramic components only. Related features: **Brick Kiln, Coke Oven, Kiln, Lime Kiln, Horno/Oven.**

Quarry: An area where geological materials are available for removal and use off-site, primarily as building materials. Use for large scale as well as small material removal sites (e.g. limestone, stone, gravel, and sand pits). Related features: **Lithic Quarry.**

Railroad Tracks/Bed: Use to designate portions of rail bed or tracks. Validation: historic components only. Related features: **Bridge, Road/Trail.**

Ramada/Shelter: All temporary shelters, including lean-tos, windbreaks, brush enclosures and sun shades. Related features: **Stone Circle, Sweat Lodge, Tent Base, Tipi Ring, Wickiup.**

Reservoir: A natural or artificial lake in which water can be stored for future use. Related features: **Spring Control Structure, Tank, Water Catchment Device, Water Control Device.**

LABORATORY OF ANTHROPOLOGY SITE RECORD

— 10. FEATURE DATA (cont.)

Continuation page ___ of ___

LA Number: ________ **Field Number:** ________

Feature Type	*Reliable ID?	No. Observed	**Assoc. Component. Nos.	Feature ID, Notes

* enter "?" for uncertain identifications

** enter zero for unknown component associations

Notes: ________

LA Number: ____________ **Field Number:** ____________

— 10. FEATURE DATA (cont.)

Feature Type	*Reliable ID?	No. Observed	**Assoc. Component. Nos.	Feature ID, Notes

* enter " ? " for uncertain identifications ** enter zero for unknown component associations

Feature Remarks: ____________

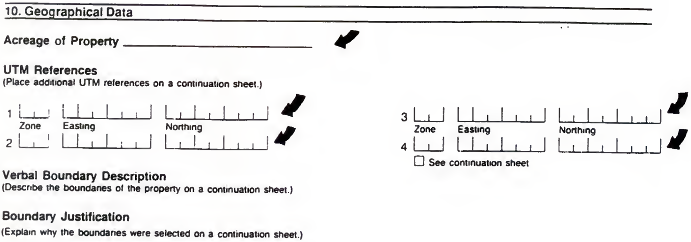
— 11. REFERENCES

***Written Sources of Information:** ____________

*this item can be skipped if this form submitted with a LA Project/Activity Record; please use American Antiquity style citations.

Additional Sources of Information: ____________

10. GEOGRAPHICAL DATA



10. Geographical Data

Acreage of Property ____________________

UTM References
(Place additional UTM references on a continuation sheet.)

	Zone	Easting	Northing
1			
2			
3			
4			

☐ See continuation sheet

Verbal Boundary Description
(Describe the boundaries of the property on a continuation sheet.)

Boundary Justification
(Explain why the boundaries were selected on a continuation sheet.)

This section defines the location and extent of the property being nominated. It also explains why the boundaries were selected. Review the guidelines on pages 56 and 57 before selecting boundaries and completing this information. For additional guidance, see *National Register Bulletin 21: How to Establish Boundaries for National Register Properties* and *National Register Bulletin 12: Definition of National Register Boundaries for Archeological Properties.*

For discontiguous districts, provide a set of geographical data—including acreage, UTMs, and a boundary description and justification—for each separate area of land. (See page 57 for an explanation of discontiguous districts.)

ACREAGE OF PROPERTY

Enter the number of acres comprising the property in the blank. Acreage should be accurate to the nearest whole acre; fractions of acres to the nearest tenth should be recorded, if known. If the property is substantially smaller than one acre, "less than one acre" may be entered. Where accuracy to one acre is not practical, for example, for districts over 100 acres, a USGS acreage estimator may be used to calculate acreage.

UTM REFERENCES

Enter one or more Universal Transverse Mercator (UTM) grid references to identify the exact location of the property. Enter only complete, unabbreviated references. Up to 26 references will be entered in the NRIS data base.

A United States Geological Survey (USGS) quadrangle map and a UTM counter are necessary tools for determining UTM reference points. The USGS map is also required documentation (see *Maps* on pages 61 to 63). Refer to *Appendix VIII* and *National Register Bulletin 28: Using the UTM Grid System to Record Historic Sites* for instructions on determining the references. Many State historic preservation offices will assist applicants in completing this item.

GUIDELINES FOR ENTERING UTM REFERENCES

- For properties less than 10 acres, enter the UTM reference for the point corresponding to the center of the property.
- For properties of 10 or more acres, enter three or more UTM references. The references should correspond to the vertices of a polygon drawn on the USGS map according the following steps:
    1. Draw a polygon of three or more sides on the USGS map that approximately encompasses the area to be registered.
    2. Label the vertices of the polygon numerically, beginning at the northwest corner and moving clockwise.
    3. Determine the UTM reference for the point corresponding to each vertex (see *Appendix VIII*).
    4. Enter the references numerically on the form. Use a continuation sheet for additional references.
- For linear properties of 10 or more acres, such as railroad, canal, highway, or trail, enter three or more UTM references. The references should correspond to the points along a line drawn on the USGS map according to the following steps:
    1. Draw a line on the USGS map indicating the course of the property.
    2. Mark and label numerically points along the line that correspond to the beginning, end, and each major shift in direction. Order numbers in sequence from beginning to end.
    3. Determine the UTM reference for each point.
    4. Enter the references numerically on the form. Use a continuation sheet for additional references.
- If UTM references define the boundaries of the property, as well as indicate location, the polygon or line delineated by the references must correspond exactly with the property's boundaries. (See *Appendix VIII.*)

VERBAL BOUNDARY DESCRIPTION

Describe the boundaries of the property. Use one of the following forms:

- A map may be substituted for a narrative verbal boundary description. Reference to the map should be made in the blank on the form. (See page 58.)
- A legal parcel number.
- A block and lot number.
- A sequence of metes and bounds.
- Dimensions of a parcel of land fixed upon a given point such as the intersection of two streets, a natural feature, or a manmade structure.

The description must be accurate and precise. Follow guidelines on page 58.

BOUNDARY JUSTIFICATION

For all properties, provide a brief and concise explanation of the reasons for selecting the boundaries. The reasons should be based on the property's historic significance and integrity, and they should conform to the *Guidelines for Selecting Boundaries* on pages 56 and 57.

The complexity and length of the justification depends on the nature of the property, the irregularity of the boundaries, and the methods used to determine the boundaries. For example, a city lot retaining its original property lines can be justified in a short sentence, while a paragraph may be needed where boundaries are very irregular, where large portions of historic acreage have been lost, or where a district's boundaries are ragged because of new construction. Properties with substantial acreage require more explanation than those confined to small city lots.

> *The boundary includes the farmhouse, outbuildings, fields, orchards, and forest that have historically been part of Meadowbrook Farm and that maintain historic integrity. That parcel of the original farm south of Highway 61 has been excluded because it has been subdivided and developed into a residential neighborhood.*

Boundaries for archeological properties often call for longer justifications, referring to the kinds of methodology employed, distribution of known sites, reliability of survey-based predictions, and amount of unsurveyed acreage.

> *The southern boundary of the site is established by the limit of cultural materials and features and roughly corresponds to a lowering in grade. The highest artifact densities recovered during surface collection were noted at the northern and western edges of the plowed field. By extrapolation, it is likely that the site extends into the wooded areas to the north and west. The western boundary is established by the railroad cut which corresponds roughly to the original terrace edge. The northern and eastern boundaries are set by the contour line marking an abrupt fall to the wetland.*

For discontiguous districts, explain in the boundary justification how the property meets the conditions for a discontiguous district and how the boundaries were selected for each area.

GUIDELINES FOR SELECTING BOUNDARIES

ALL PROPERTIES

- Carefully select boundaries to encompass, but not to exceed, the full extent of the significant resources and land area making up the property.
- The area to be registered should be large enough to include all historic features of the property, but should not include "buffer zones" or acreage not directly contributing to the significance of the property.
- Leave out peripheral areas of the property that no longer retain integrity, due to subdivision, development, or other changes.
- "Donut holes" are not allowed. No area or resources within a set of boundaries may be excluded from listing in the National Register. Identify nonhistoric resources within the boundaries as noncontributing.
- Use the following features to mark the boundaries:

  1. Legally recorded boundary lines.
  2. Natural topographic features, such as ridges, valleys, rivers, and forests.
  3. Manmade features, such as stone walls; hedgerows; the curblines of highways, streets, and roads; areas of new construction.
  4. For large properties, topographic features, contour lines, and section lines marked on USGS maps.

BUILDINGS, STRUCTURES AND OBJECTS

- Select boundaries that encompass the entire resource, with historic and contemporary additions. Include any surrounding land historically associated with the resource that retains its historic integrity and contributes to the property's historic significance.
- For **objects**, such as sculpture, and **structures**, such as ships, boats, and railroad cars and locomotives, the boundaries may be the land or water occupied by the resource without any surroundings.
- For **urban and suburban properties** that retain their historic boundaries and integrity, use the legally recorded parcel number or lot lines.
- Boundaries for **rural properties** may be based on:

  1. A small parcel drawn to immediately encompass the significant resources, including outbuildings and associated setting, or
  2. Acreage, including fields, forests, and open range, that was associated with the property historically and conveys the property's historic setting. (This area must have historic integrity and contribute to the property's historic significance.)

HISTORIC SITES

- For historic sites, select boundaries that encompass the area where the historic events took place. Include only portions of the site retaining historic integrity and documented to have been directly associated with the event.

HISTORIC AND ARCHITECTURAL DISTRICTS

- Select boundaries to encompass the single area of land containing the significant concentration of buildings, sites, structures, or objects making up the district. The district's significance and historic integrity should help determine the boundaries. Consider the following factors:

  1. **Visual barriers** that mark a change in the historic character of the area or that break the continuity of the district, such as new construction, highways, or development of a different character.
  2. **Visual changes** in the character of the area due to different architectural styles, types or periods, or to a decline in the concentration of contributing resources.

3. **Boundaries at a specific time in history**, such as the original city limits or the legally recorded boundaries of a housing subdivision, estate, or ranch.

4. **Clearly differentiated patterns of historical development**, such as commercial versus residential or industrial.

- A historic district may contain discontiguous elements only under the following circumstances:

  1. **When visual continuity is not a factor of historic significance, when resources are geographically separate, and when the intervening space lacks significance**: for example, a cemetery located outside a rural village.

  2. **When manmade resources are interconnected by natural features** that are excluded from the National Register listing: for example, a canal system that incorporates natural waterways.

  3. **When a portion of a district has been separated by intervening development** or highway construction and when the separated portion has sufficient significance and integrity to meet the National Register criteria.

ARCHEOLOGICAL SITES AND DISTRICTS

- The selection of boundaries for archeological sites and districts depends primarily on the scale and horizontal extent of the significant features. A regional pattern or assemblage of remains, a location of repeated habitation, a location or a single habitation, or some other distribution of archeological evidence, all imply different spatial scales. Although it is not always possible to determine the boundaries of a site conclusively, a knowledge of local cultural history and related features such as site type can help predict the extent of a site. Consider the property's setting and physical characteristics along with the results of archeological survey to determine the most suitable approach.

- Obtain evidence through one or several of the following techniques:

  1. **Subsurface testing**, including test excavations, core and auger borings, and observation of cut banks.

  2. **Surface observation of site features and materials** that have been uncovered by plowing or other disturbance or that have remained on the surface since deposition.

  3. **Observation of topographic or other natural features** that may or may not have been present during the period of significance.

  4. **Observation of land alterations** subsequent to site formation that may have affected the integrity of the site.

  5. **Study of historical or ethnographic documents**, such as maps and journals.

- **If the techniques listed above cannot be applied**, set the boundaries by conservatively estimating the extent and location of the significant features. Thoroughly explain the basis for selecting the boundaries in the boundary justification.

- **If a portion of a known site cannot be tested** because access to the property has been denied by the owner, the boundaries may be drawn along the legal property lines of the portion that is accessible, provided that portion by itself has sufficient significance to meet the National Register criteria and the full extent of the site is unknown.

- Archeological districts may contain discontiguous elements under the following circumstances:

  1. When one or several outlying sites has a direct relationship to the significance of the main portion of the district, through common cultural affiliation or as related elements of a pattern of land use, and

  2. When the intervening space does not have known significant resources.

  (Geographically separate sites not forming a discontiguous district may be nominated together as individual properties within a multiple property submission.)

GUIDELINES FOR VERBAL BOUNDARY DESCRIPTION

- A map drawn to a scale of at least 1" = 200 feet may be used in place of a narrative verbal description. When using a map, note under the heading "verbal boundary description" that the boundaries are indicated on the accompanying base map. The map must clearly indicate the boundaries of the property in relationship to standing structures or natural or manmade features such as rivers, highways, or shorelines. Plat, local planning, or tax maps may be used. Maps must include the scale and a north arrow.

  The boundary of Livermore Plantation is shown as the dotted line on the accompanying map entitled "Survey, Livermore Plantation, 1958."

- For properties whose boundaries correspond to a polygon, section lines, or contour lines on the USGS map, the boundaries marked on the USGS map may be used in place of a verbal boundary description. In this case, simply note under the heading "verbal boundary description" that the boundary line is indicated on the USGS map. If USGS quadrangle maps are not available, provide a map of similar scale and a careful and accurate description including street names, property lines, or geographical features that delineate the perimeter of the boundary.

  The boundary of the nominated property is delineated by the polygon whose vertices are marked by the following UTM reference points: A 18 313500 4136270, B 18 312770 4135940, C 18 313040 4136490.

- To describe only a portion of a city lot, use fractions, dimensions, or other means.

  The south 1/2 of Lot 36

  The eastern 20 feet of Lot 57

- If none of the options listed above are feasible, describe the boundaries in a narrative using street names, property lines, geographical features, and other lines of convenience. Begin by defining a fixed reference point and proceed by describing the perimeter in an orderly sequence, incorporating both dimensions and direction. Draw boundaries that correspond to rights-of-way to one side or the other but not along the centerline.

  Beginning at a point on the east bank of the Lazy River and 60' south of the center of Maple Avenue, proceed east 150' along the rear property lines of 212-216 Maple Avenue to the west curbline of Main Street. Then proceed north 150' along the west curbline of Main Street, turning west for 50' along the rear property line of 217 Maple Avenue. Then proceed north 50' to the rear property line of 215 Maple Avenue, turning west for 100' to the east bank of the Lazy River. Then proceed south along the river bank to the point of origin.

- For rural properties where it is difficult to establish fixed reference points such as highways, roads, legal parcels of land, or tax parcels, refer to the section grid appearing on the USGS map if it corresponds to the actual boundaries.

  NW 1/4, SE 1/4, NE 1/4, SW 1/4, Section 28, Township 35, Range 17

- For rural properties less than one acre, the description may be based on the dimensions of the property fixed upon a single point of reference.

  The property is a rectangular parcel measuring 50 x 100 feet, whose northwest corner is 15 feet directly northwest of the northwest corner of the foundation of the barn and whose southeast corner is 15 feet directly southeast of the southeast corner of the foundation of the farmhouse.

- For objects and structures, such as sculpture, ships and boats, railroad locomotives or rolling stock, and aircraft, the description may refer to the extent of dimensions of the property and give its location.

  The ship at permanent berth at Pier 56.

  The statue whose boundaries form a circle with a radius of 17.5 feet centered on the statue located in Oak Hill Park.

Land Management situation/problem:

In the area of the Massey Draw archeological site (5JF339) developers desire to establish a golf course for the public. The ninth hole is planned uncomfortably close to the site. The site 5JF339 is eligible for the National Register of Historic Places.

The Colorado SHPO wishes the GeoData class to obtain some of the information needed to complete the National Register of Historic Places Nomination. In general, the official boundary must be established and set forth for the world to see. Specifically, the needed information is the Acreage of Property and the UTM References as described in Section 10. GEOGRAPHIC DATA (page 54) of NATIONAL REGISTER BULLETIN -16A (see copy in following pages).

The property boundary has been determined in accordance with BULLETIN -16A (Pages 56 and 57) and marked at four corners with pink fluorescent flagging tape.

When the renowned pseudo-archeologist, Stanley Q. Foggbottom, Esq. was hired by the developers to define the Massey Draw Site boundary based upon the site reports, Stan made a startling discovery. Foggbottom located the tombs of the long lost late archaic buffalo killer society priests. These three midget Ogam speaking troglodytes were entombed side by side at the mouth of their ceremonial cave according to VonDaniken's published accounts in Chariots of the Gods and elsewhere. Amazingly, the tombs, their pictographs, and the mouth of their cave are features entirely missed by the original excavation crews.

These features must be added to the NMCRIS database and the exact location captured in GIS and in the RDBMS (for researchers querying the NMCRIS information) data so that when the total station mapping accomplished during excavation of the site is added to GIS, these new startling features may be spatially related to the rest of the site features. Also, travel routes and distances to other period sites and to other Ogam features in the area will tend to validate (or not) Foggbottom's claims. Spatial (and other) analysis will be necessary because the interpretation of the tombs is likely to be considered controversial.

The developers have high regard and respect for the site but must know its boundaries so that they can lay out their golf course. Of course, there is always that possibility that development plans and the official site boundary will become a legal issue. Because a Section 106 consultation** must be prepared for the State Historic Preservation Officer, and the site boundary as it relates to the golf course plans must be mapped, you must establish for the site boundary precise geo-coordinates, a mapped representation that will orientate everyone to the surroundings and the legal land description.

Note that it is stated in the NMCRIS User's Guide: Guidelines for Submitting Archeological Records on page 4-15 "PLSS locations are NOT true legal property descriptions". In fact, PLSS **is** the true and legal property description if the site boundaries follow the PLSS net. The monuments become property corners. If the PLSS **is not** followed, then the boundaries in question must be surveyed to become "legal".

The site's nomination to the National Register and boundary definition from GPS also do not constitute a legal boundary. NRHP area nominations "Geographic Data" (page 54 of the National Register Bulletin) are not truly "legal" boundaries. Explain why this is so and be prepared to explain verbally a remedy using the skills that you have gained in this course.

** Law and regulation require that prior to any undertaking that will alter an eligible archeological feature on Federal land, the federal land manager must consult with the State Historic Preservation Officer (SHPO). The SHPO is appointed by the Governor of each state in accordance with Federal statute.

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GPS DATA TRANSFER & PROCESSING EXERCISE

The objective of this exercise is to download the rover files you collected on your GPS receiver to a PC running Pfinder software, and process the data for integration with GIS. Once the files are transferred and stored under your project name, you will differentially correct those rover files against a base station file (with data recorded during the same time period as your rover files) already loaded on the PC. Then you will convert the GPS data to ASCII files in an ARC/INFO GIS format.

Note: Differential correction should be performed before any other operations available in Pfinder are done. Some of the operations in Pfinder alter GPS data so that differential correction cannot be performed subsequently.

Data Transfer (Rover Files to PC)

1. Get into Pfinder. At the C:\ prompt type: **cd pfpro**

2. At the C:\pfpro prompt type: **pfinder**. The Pfinder main menu will appear.

3. Click on **Project** and **Set Current**.

4. Click on **GeoData** and **Okay**.

5. At the main menu, click on **Comm** and **Communication Port**.

6. Select COM port **COM1** and click **Okay**.

7. Connect the datalogger to the PC using the 9-pin modem cable. Plug one end into the datalogger and the other into the COM port on the PC.

8. Turn on the datalogger.

9. In Pfinder, click on **Comm** and **Data Files to PC**.

10. On the datalogger, select **File Transfer** from main menu. The message: *Connect Cable to PC* will appear.

11. Press **Enter**. A list of files on the datalogger will appear.

12. Click on the **name of each file** you want to transfer and **Okay**. (You can select more than one files at a time.)

Differential Correction (Rover File against Base File)

1. In the Pfinder main menu, click on **Utils** and **Differential Correction**. The Differential Correction dialog box will appear.

2. Click on **Base**. The Enter Base File dialog box will appear. Click on **Default** and **FileSpec**., then click on **BASE0614.SSF** and click **Okay** and **Okay**.

> Entering the base file name sets the correct and corresponding Difference filename.

3. Click on **Rover**. The Enter Rover File dialog box will appear. Click on **Default** and **FileSpec**., then click on **the .SSF file** you want to correct and click **Okay** and **Okay**.

> Entering the rover file name sets the correct and corresponding **Corrected** filename.

4. When all files have been selected, in the Differential Correction box, click **Okay**. A window will appear showing the files used and created, as well as the number of positions corrected

5. Repeat **Steps 2 and 3** for each file you want to correct.

6. Click on **Done**. You should now have a .COR file for each of the .SSF files you corrected.

7. To check for **.COR** files, in the Differential Correction dialog box, click on **Corrected.** In the Enter Corrected Filename box at FileSpec., type ***.cor** and click on **Find**. A list will appear.

8. To exit, click on **Okay**, then **Cancel** and **Done**.

Data Viewing

Ken will lead you through viewing your corrected and uncorrected data to see the difference in the data files and understand better why you correct the data.

Output to GIS Format

1. In the Pfinder main menu, click on **Output** and **GIS**. A GIS output menu will appear.

2. Click on menu item **GIS**.

Select: **Arc Info-Info**
Okay

3. Click on menu item **Options**. A pull -down menu of options with parameters to set will appear.

4. Click on **Data Type**.

Select: **Features Only**
SVs 4 or More
Corrected Only
Okay

5. Click on **Attribute Type.**

   Select: **Attribute Value**
   Nbr Pos per Feature
   Okay

6. Click on **Number of Vertices.**

   Select: **All**
   Okay

7. Click on **Starting Feature ID.**

   Select: **1**
   Okay

8. Click on **Elevation to Output.**

   Select: **No Elevation**
   Okay

9. Click on **Geodetic Datum.**

   Select: **NAD-27 CONUS**
   Okay

10. Click on **Coordinate System.**

    Select: **Universal Transverse Mercator**
    Okay
    NAD-27 CONUS
    Okay

11. Click on **Units Configuration.**

    Select: **Default**
    Angle: **Seconds**
    Height: **Ellipsoid**
    Distance: **Meters**
    Decimal Accuracy: **3**
    Velocity: **Meters/Second**
    Quadrant: **NS/EW**
    Okay

Note: Position Date Format option is not valid with Arc Info-Info GIS format. No need to set its parameters in this exercise.

12. Click on **File** in GIS output menu.

13. Click on **Input Files**. A dialog box will appear with a list of files in the GeoData project.

14. Click on **all the files you want to output** to an ASCII file in ARC/INFO format. A dialog box will appear after each file is selected asking for the following: All Pts Mean Pt Join as a line Join as a polygon
    Select: **All Pts** (for each file)
15. Click on **Output Path**.

        Select
            Drive: **C:**
            Directory: **\pfpro\data\geodata**
            Okay

16. Click on **Direct Output To**.

        Select: **File**
            Okay

17. Click on **Feature Output**.

        Select: **One Feature per File**
            Output Feature Name

18. Click on menu item **Info**. This option displays a summary of all the settings you chose. You can check this option to be sure you have the right settings.

        Select: **Okay**

19. Click on menu item **Run**.

20. Click on **Preview Graphics** to see a display of the files you've chosen to out put to GIS. Click anywhere in the display to close the display and return to the GIS output menu.

21. Click on **Execute Conversion**. The files you selected as input files are converted to ARC/INFO format ASCII files that can be used to create GIS coverages.

22. Click on **View GIS Output**. A dialog box will appear.

23. In **File Spec** box, type: ***.gen**, ***.pts**, ***.pa**, ***.aa**, and/or ***.inf** to view a list of the output files that will be used to create ARC/INFO coverages. You may want to check that all of the files you selected were actually output to GIS ASCII format.

24. After viewing the file list, click on **Quit** and **Quit** to exit Pfinder.

25. At the C:\pfpro prompt, type: **cd data**

26. At the C:\pfpro\data prompt, type **dir/w**

27. Insert a disk into the floppy drive.

28. Copy the following to the floppy disk:

***.gen**
***.pts**
***.pa**
***.aa**
***.inf**

You will load the files onto the workstations where you'll use them to create ARC/INFO coverages of the features you mapped.

NOTE: The .gml and .sml files generated by Pfinder in GIS output are not currently usable due to errors in the command structure within the files. The Arc Macro Language (AML) program you will use does not require the.gml and .sml files and will automatically create ARC/INFO coverages from the output files *.gen, *.pa, *.aa, *.inf and *.pts.

What's New in the Pathfinder World?

Prepare by Kelly Bobbitt

There are many changes, new terminology, and some compatibility issues that need to be addressed in the new Pathfinder products. The following should explain what is what, and who goes with what, etc.

Receivers

There are different technologies in our various receivers that will be summarized. These technologies have different capabilities. The receivers are:

TANS receivers are Gauss-based technology and include:
- 2-, 3-, 6-channel Pathfinder Professionals
- 6-channel Pathfinder Community Base Stations

The 6-channel receivers are sometimes referred to as Newton receivers.

BASIC receivers are Gauss-based technology and include:
- 3-channel Pathfinder Basic
- 6-channel Basic Plus
- 6-channel Basic XL (can record Synchronized Measurements)

GEOEXPLORER are Gauss-based technology and include:
- 6-channel GeoExplorer (can record Synchronized Measurements)

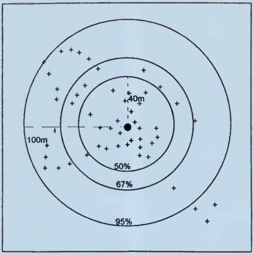
PRO receivers are Maxwell-based technology and include:
- 8- or 12-Channel Pathfinder Pro XL (can record Synchronized Measurements)
- 12-channel Community Base Station (can record Synchronized Measurements)

These receivers are sometimes referred to as MARS receivers (Trimble internal name).

4000 receivers are Maxwell-based technology and include:
- 9-channel GIS Surveyor

This is a survey grade receiver (carrier phase) used as a mapping grade receiver (code phase). This receiver can be upgraded to survey quality work.

Both technologies have autonomous accuracies (one GPS receiver without differential corrections) of 100 meters 2DRMS (95 percentile) or translated to 40 meters CEP (50 percentile). This means 95% of the resulting positions will be within 100 meters and 50% of the positions will be within 40 meters.



The Gauss-based receiver is an older technology that is capable of 1-5 meter accuracy CEP (50 percentile) with differential correction.

The newer Maxwell based technology is sub-meter RMS (67 percentile) + 10 ppm times the distance between base and rover with differential correction. To achieve this accuracy involves using two Maxwell based receivers and the regular code phase differential correction. Better accuracy can be achieved using the DECIMETER Processor (carrier phase processing).

Sub-meter code phase solutions can be achieved due to the following:

- Maxwell chip technology
- Synchronized Measurements on the base
- Overdetermined Solutions on the rover.
- The Professional Receiver's "Compensation for Multipath Errors and Ionospheric Delays in Differential Satellite Positioning Systems" (patent pending) technique
- PDOP ≤4, SNR≤6, Elevation Mask of 15°

Differential Correction

In Trimble's differential correction (MCORR300), measurements from the base receiver are used to correct positions from the rover receiver. As always, this means that satellites being used by the rover to calculate the position (whether 3 satellites, 4, 5, 6 ...) must be visible to the base.

One improvement we have seen in performance is just by using a 12-channel receiver as the base, even if you still use one of the older Gauss based receivers as the rover. The reason is this receiver can record Synchronized Measurements, instead of our traditional Raw Measurements. Therefore, the benefits of using Synchronized over Raw Measurements are being realized.

Below is a brief comparison of the two types of measurements (Raw and Synchronized) and why the user gains by using Synchronized Measurements (both for regular code phase solutions and decimeter processing).

Raw Measurements

Raw measurements can be recorded using any of the Pathfinder receivers These measurements are not taken from all visible satellites at precisely the same time (not synchronized).

This measurement contains:

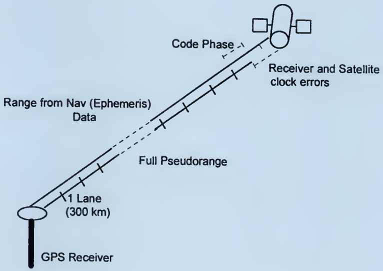
- Code Phase
- Doppler
- SNR
- Time of Week - TOW (Time tag in seconds into the GPS week)

Synchronized Measurements

Synchronized Measurements can be recorded using the GeoExplorer, Basic XL, Pro XL and Pathfinder Community Base Station (12-channel). These measurements are taken from all visible satellites at precisely the same time (synchronized)

This measurement contains:

- Full pseudorange
- Doppler
- SNR
- Time of Week - TOW (Time tag in seconds into the GPS week)
- Receiver clock error
- Continuous carrier phase (needed for decimeter processing)


Code Phase
Receiver and Satellite clock errors
Range from Nav (Ephemeris) Data
Full Pseudorange
1 Lane (300 km)
GPS Receiver

Benefits of Synchronized Measurements

These benefits are noticed when Synced Measurements are collected in the base regardless of what type of rover is being used. If, however, the rover is also Maxwell based then you will optimize the benefits of the resulting corrections.

- The fact that all measurements are synchronized increases the accuracy of code phase corrections.
- Using Synchronized Measurements the receiver clock error is known; whereas, with Raw Measurements it is estimated. This will help increase accuracy of the corrections.
- MCORR300 using Raw Measurements uses a 6 point average. With the Synchronized Measurements this averaging is not needed and better results are obtained.
- Decimeter accuracy can only be performed if the rover has Synced Measurement capabilities (Pro XL, GeoExplorer, Basic XL, GIS Surveyor), and the base also is collecting Synced Measurements.

☒Note: If you collect Synced Measurements and a gap of more than 10 seconds is found in the base file, the differential correction will treat this time period as Raw Measurements (will use the 6-point average which will result in sub-optimum accuracy). A message will appear at the end of the correction process indicating this has occurred.

Correcting Synchronized Measurements

In order to perform differential correction using a base that was recording Synchronized Measurements, you must use PFINDER 2.5 or above. It does not matter what Trimble rover you are using.

Best Four Satellites vs. Overdetermined Solutions

In the past (TANS firmware 1.15 and before), the Pathfinder series of receivers used four satellites that had the best PDOP (Position Dilution of Precision) to calculate a position (we will refer to this as "Bet Four").

There is a better method to calculate a position using Overdetermined Solutions. Overdetermined Solutions use 5 or more satellites. The benefit of this is two-fold: the first benefit is that with more satellites there is more integrity checking of those satellites. The second, benefit is that the PDOP is lower with more satellites used for a position (sometimes just marginally lower). Because PDOP influences the final solution, the lower the PDOP the better the resulting position.

The following Trimble receivers are capable of producing overdetermined solutions:

ProXL
Basic XL
GeoExplorer
GIS Surveyor

Correcting Overdetermined Solutions

Overdetermined solutions are not relevant for a base. This is because, as mentioned earlier, the differential correction only uses measurements (Raw or Synced) from the base to correct positions from the rover. It does not matter if the rover is using 4 satellites or more, PFINDER 2.4 or above will correct it.

As mentioned above if the base was using Synchronized Measurements you must use PFINDER 2.5 or above. It does not matter if the rover is using Overdetermined or Best Four.

Decimeter Processing

An upcoming feature to the Pathfinder series is DECIMETER Processing. This involves using the carrier phase data from the Synchronized Measurements on both the rover and base receiver. This means the only receivers capable of performing this type of process are:

GeoExplorer (Sub-meter accuracy)
Basic XL (Sub-meter accuracy)
Pro XL (Decimeter accuracy)

This capability is only for point locations in the open (losing lock of the satellites as not permitted)and will probably involve about a 10-minute occupation (still being tested).

Trimble's DECIMETER kit is a Microsoft Windows ® based software package that processes this high accuracy data. If one rover file has both high accuracy (carrier phase) and normal accuracy (code phase) data in it, then the file will have to be passed through both MCORR3000 and the DECIMETER Processor.

Conclusion

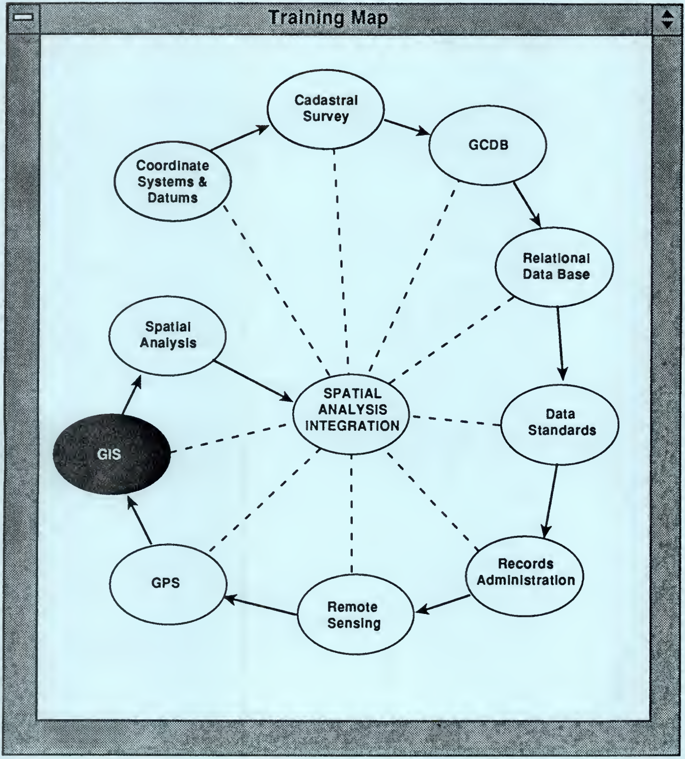
The following table shows who is capable of what with whom.......

Rover

Base	*Best Four*	*Overdetermined*	*High Accuracy*	**Base Receiver Type**
Raw Measurements	PFINDER 2.4 (or above)	PFINDER 2.4 (or above)	Not Possible	Any Trimble Pathfinder Receiver (Except Geo)
Synced Measurements	PFINDER 2.53 (or above)*	PFINDER 2.53 (or above)*	DECIMETER PROCESSOR	Pro XL GeoExplorer Basic XL GIS Surveyor 12-Ch CBS
	Any Trimble Pathfinder Receiver**	Pro XL GeoExplorer** Basic XL GIS Surveyor	Pro XL GeoExplorer Basic XL	

Rover Receiver Type

GEO - DATA COLLECTION & USE
(for Ecosystem Based Management)



Course No. 1730-11

GEOGRAPHIC INFORMATION SYSTEMS (GIS)

LESSON OBJECTIVE

By discussion of the principles of GIS and examining GIS layering the Trainee will be able to:

- ☞ Understand and the basic structure of GIS
- ☞ Perform a GIS analysis with both analog (hardcopy) and a digital (softcopy) data.

GEOGRAPHIC INFORMATION SYSTEMS

GIS are *not* CAD, AM/FM systems, or plain mapping tools.

What is a GIS?

A *Geographic Information System* (GIS) is a computerized database management system designed to accomplish the following functions with spatial data:

- Data capture
- Data management
- Data manipulation
- Information analysis
- Information display

Data in a GIS are spatially or geographically referenced. Each object found in a GIS can be related to some location on the earth and can be mapped. The objects in a GIS are defined by their location and by multiple attributes that describe characteristics of the object. The computer files containing the GIS information can be related to each other in a continuous geographic database.

DATA CAPTURE

A GIS allows you to integrate data that has been collected at different times, at different scales, and using different methods of data capture. Sources of data include maps on paper or transparency, written data, digital files, remote sensing data (both hardcopy and digital), Global Positioning System (GPS) files, and information stored in human memory. Without a GIS, integrating data in different formats, from different times, and at different scales is very time consuming and expensive.

Types of Data

There are three types of data: vector, raster, and attribute data.

VECTOR DATA

Vector data is sometimes referred to as cartographic data. It is the geographic features described on a map in a digital form, usually a list of x,y coordinates. These features are portrayed as points, lines, and polygons.

Points

A point represents a feature for which only one geographic location is needed. Examples of point features include nest sites, wells, and mine shafts.

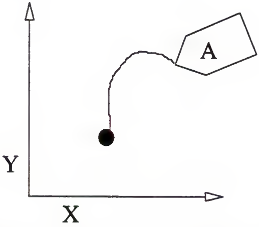


Figure 1. Point defined by X,Y coordinate with attribute tag.

Lines (Arcs)

A line is made up of a series of connected points. The end points are referred to as nodes and the points between are vertices. A line is one-dimensional, having length but no width. Examples of line features include streams, roads, and animal trails.

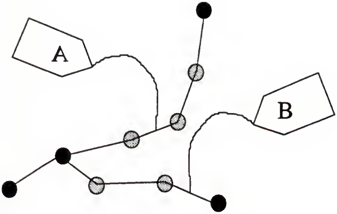


Figure 2. Lines with nodes (dark circles), vertices (shaded circles), and attribute tags.

Polygons (Areas)

A polygon is an area enclosed by lines or arcs. It is two-dimensional, having length and width. Examples of polygon features include areas of common soil types, forest types, and wetlands.

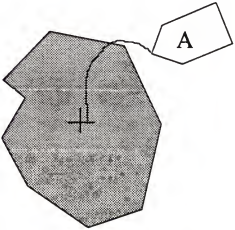


Figure 3. Polygon with attribute tag at label.

Topology

Topology provides the logic that connects points, lines, and polygons to each other. It describes how features relate spatially to each other and is not usually changed by the GIS operator, in fact, it is transparent to the user.

When describing where something is, you usually say it is to the left of, nex to, or some distance from something else. This definition is not precise enough for a GIS. A GIS requires the precise definitions that topology provides to perform spatial analysis.

Topology defines the positional relationship of features by defining properties of features. It includes information about what labels are connected to which features, how points are connected to each other, and which points and lines make up which polygons. This information is stored within the GIS. The topological information allows the GIS to perform spatial relationship functions like overlay, buffer, and proximity.

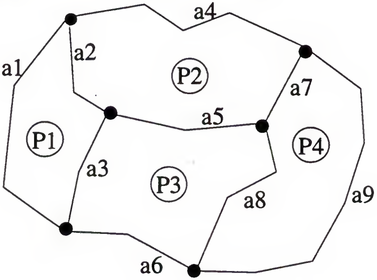


Figure 4. The topology of these polygons includes: arcs a1, a2, and a3 make up P1; a2, a4, and a5 make up P2; a3, a5, a6, and a8 belong to P3; a7, a8, and a9 make up P4; P1 is right of a1 and left of a2 and a3; P2 is right of a2, below a4, above a5, and right of a7; P3 is right of a3, below a5, above a6, and left of a8; and P4 is right of a7 and a8 and left of a9.

ATTRIBUTE DATA

Attribute data is non-graphic. It is descriptive information stored in a database about the features (points, lines, polygons, cells) in the GIS. One attribute common to all features is location. Other attributes depend on the type of feature and what characteristics are important for a particular purpose or application. For example:

- A land parcel has an owner, a size, and a use.
- An oil well is of a certain type and has a daily flow rate.
- A road has a name, a surface type, and can have a route or designation number.

Each of these characteristics can be specifically identified in a GIS by giving it an attribute name, such as OWNER, FLOW_RATE, or ROAD_NAME.

Each attribute has a set of possible values called the domain and are described in a data dictionary for the application. These values can be queried, sorted, etc. and the results displayed or used for analysis.

RASTER DATA

Raster data describes features as continuous "cells" of data in a grid. Each cell represents an area of ground and has a value. The value may be an elevation, a land use class, or a spectral reflectance value to a sensor.

Each raster "map" is made up of cells arranged in rows and columns. Each cell is a rectangle or square of constant size. The size of the cells determine the resolution of the map. As the size the cells decrease, the resolution of the map increases, but so does the storage requirement in the computer so this trade off must be considered when choosing map resolution.

Raster data is easy and fast to analyze, especially for neighborhood-type problems, because the computer does not have to search through lists of coordinates to answer each question.

Examples of raster data include digital orthophoto quadrangles (DOQs), satellite remote sensing data, and digital elevation models (DEMs).

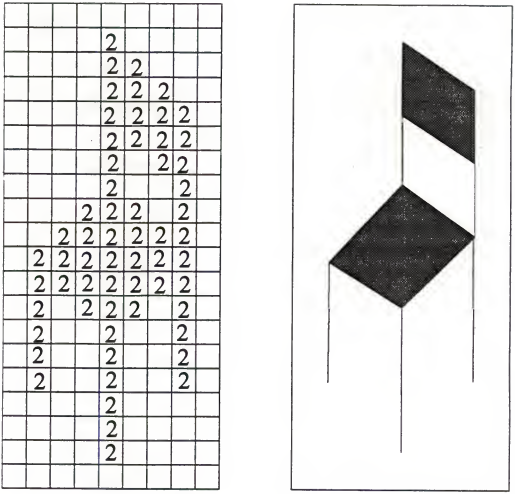


Figure 5. An image of a chair in raster or grid-cell format and in vector format

DATA MANAGEMENT

Data management includes maintaining standards; copying and storing files; converting data to different formats for sharing; data dictionary and metadata (data about data) creation; linking data sets together; controlling user access to files for reading, modifying, and deleting data or files; and data backups and archival. It includes all the "household duties" of the GIS without which nothing else can be accomplished. Some of these duties are accomplished automatically and kept track of within the GIS and the rest require human intervention and manual record keeping.

DATA MANIPULATION

Data manipulation includes converting to common scales, projections, units, and datums; classifying or reclassifying data; georeferencing and rectification functions; raster-to-vector and vector-to-raster operations; and resampling.

INFORMATION ANALYSIS

The power and utility of GIS is its ability to analyze the spatial data to provide information and answering the following questions:

Location: What is at . . . ?

The first question seeks to find out what exists at a particular location. A location can be described in many ways using, for example, a place name, a legal description, or a geographic reference, such as latitude and longitude.

Condition: Where is . . . ?

The second question is the converse of the first and requires spatial analysis to answer. Instead of identifying what exists at a given location, you want to find a location(s) where certain conditions are satisfied (e.g., an unforested section of land at least 2,000 square meters in size, within 100 meters of a road, and with soils suitable for supporting agriculture).

Trends: What has changed since . . . ?

The third question might involve both of the first two and seeks to find the differences within an area over time or between management scenarios.

Patterns: What spatial pattern exists?

This question is more sophisticated. You might ask this question to determine whether grasshopper infestation is likely for a landscape or what is the correlation between vegetation type with aspect. Just as important, you might want to know how many anomalies there are that don't fit the pattern and where they are located.

Modelling: What if . . . ?

"What if . . . " questions are posed to determine what happens, for example, if a new road is added to a network, if a toxic substance seeps into the local groundwater supply, or if a fire started at a certain location. Answering this type of question requires geographic as well as other information.

INFORMATION DISPLAY

Information display includes creating plots, displaying statistics on data, creating cartographic products, and combining these products in reports. Some products created with a GIS are simply screen displays. Others products are copies of tabular files or maps, or files for use in other computer systems

GIS REFERENCES

SOURCES for FUTURE READING

1. Geographical Information Systems: A Guide To the Technology; by John C. Antenucci, Kay Brown, Peter L. Croswell, Michael J. Kevany with Hugh Archer; published by Van Nostrand Reinhold, **1991**.

2. Geographic Information System: An Introduction; by Jeffrey L. Star and John E. Estes; published by Prentice Hall, **1990**.

3. Understanding GIS: The ARC/INFO Method; by Environmental Systems Research Institute, Inc. (ESRI); published by ESRI, Inc., **1990, 1991, 1992, 1994**.

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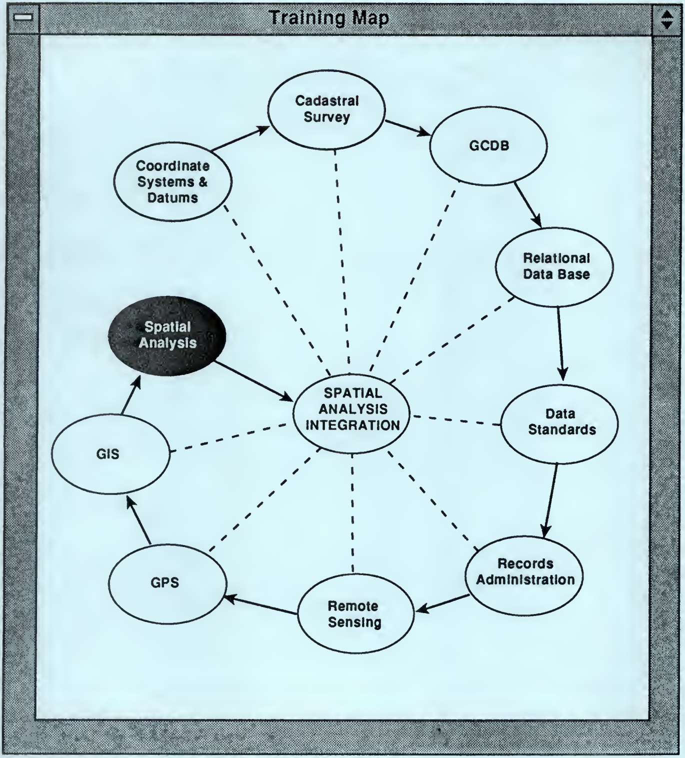
(for Ecosystem Based Management)



Course No. 1730-11

June 15, 1995

SPATIAL INTEGRATION EXERCISE

Objective: This exercise familiarizes the trainees with ability to make coverages (maps) from the GPS ASCII files generated by Pfinder. Further, the student reinforces the knowledge of the capabilities of GIS as a tool to manipulate and obtain information from a variety of sources.

PART I

1. Login to your workstation.

train_***xx***
teams1

In the AIX window (the large white window with the UNIX "$" prompt), type the following strings of text shown between the ":

The "$" prompt is shown. Do not type the initial $ prompt again.

"$. /blm.share/geosetup" The period following the prompt is a UNIX command followed by a space.

"$alias" The list of items on the screen should include:

geowork
mygeodir
loadgps
x300

If these items are not present on your screen, notify an instructor.

"$geowork"

"$pwd" You should be in the geodata directory.

"$mygeodir _first name initial and last name_" example "$***mygeodir dmartin***"
You have created a directory below the geodata directory named after yourself in which you can process your GPS ASCII files into coverages.

"$cd _first name initial and last name_" example "$***cd dmartin***"

"$pwd" You should be in the directory you just created.

Insert the diskette with your GPS data into the workstation diskdrive. Workstations 2, 8 , and 12 must share a diskdrive.

"$loadgps a:* ." Don't miss the period.

"$ls" Do you see the ASCII GPS files that you created in the directory with you name? Let's turn them into coverages!

"$cd .."
"$pwd" Are you in the geodata directory? If so, lets start ARC/INFO.

"$arc" Now you will see the arc prompt "arc:".

In the arc prompt in the window (the large white window with the arc "arc:" prompt), type the following strings of text shown between the ":
Again don't repeat the arc:

"arc:cw *first name initial and last name*" example "$***cw dmartin***" You have created an ARC/INFO workspace below the geodata directory named after yourself in which you can process your GPS ASCII files into coverages. This action turns that existing UNIX directory into a legitimate ARC/INFO workspace.

"arc:lw" You should now see a workspace *first name initial and last name*.

"arc:w *first name initial and last name*" This tells ARC/INFO to go be in that workspace.

"arc:ls" Are those GPS ASCII files there? This provides you a listing of files to refer to when typing your AML commands which follow. You can cut and paste by highlighting with the left mouse button and pasting with the middle mouse button. Any time you need that list of files again as they scroll off the screen, just do an "ls".

"arc:&r scgps2gis <cover> polys" For <cover> use the GPS ASCII filename without the extension. That is, you will see "arch_s1.gen, arch_s1.inf, arch_s1.pts", etc.. Use the arch_s1 for your <cover> name. The kinds of extensions to the files indicate what kind of data they are (polys, lines or points), however, you also know this from having chosen the format when you collect the data. When you did streams, you were collecting line data, etc.. You will be

&r scgps2gis <cover> points
″ ″ ″ lines

To print UNIX screen: xwd | xpr ␣ -device ␣ ps | lp ␣ -dps300 prompted for information needed by the program. Say yes to "features".

"arc:lc" What coverages do you have?

"arc:tables" Now you will get the INFO prompt "ENTER COMMAND>"

"ENTER COMMAND>dir"
"ENTER COMMAND>select ***filename***.pat" You can cut and paste by highlighting with the left mouse button and pasting with the middle mouse button.
"ENTER COMMAND>items" Are those the same data dictionary categories that you have come to know and love?
"ENTER COMMAND>list" Is the data correct?
"ENTER COMMAND>q stop" Now you are back at the ARC/INFO prompt.

"arc:&r scgps2gis <cover> **lines**" Now process some of your line data. Go through the same process as above. That is, use "lc" and "tables" commands at the arc: prompt.

"arc&r scgps2gis <cover> **points:**" Now process some of your point data. Go through the same process as above. That is, use "lc" and "tables" commands at the arc: prompt.

"arc:quit" Now you are back at the "$" prompt.

q stop — takes out of arc

PART II

This exercise uses ArcView software for displaying ArcInfo coverages and image data. These tools are used to solve the Land Management situation/problem introduced earlier in the class.

1. At the "$" prompt, type geowork. Use pwd to insure that you are in the geodata directory. Then start ARCVIEW with arcview&. Open the workspace *first name initial and last name*. Examine the GPS coverages and tables that you built.

type ARC
w letort

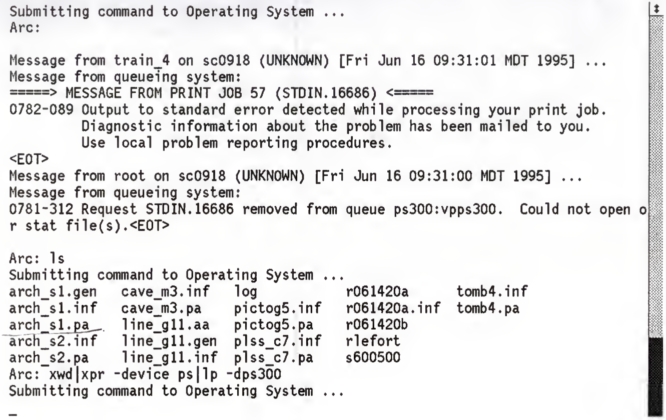
2. Select ARCVIEW's file function. Choose ADD. In the GOTO box navigate to geodata. Add some other data such as the spot images or **Digital** orthophoto and other "maps" useful to compare to the data that you created.

3. Turn on the **Archeological Sites** (sites2). Can you locate the Massey Draw site? Once located determine the UTM x, y coordinate by positioning the cursor on the site and reading the coordinates on the upper bar of the viewer window. ***Look back to the class notebook at the Land Management situation/problem in the GPS section of your notebook.*** Remember that you were tasked by the SHPO to fill in the blanks on the National Register Form (page 54). Fill in those UTMs for the four corners of the boundary. Think about how you might have to do this if you were not using ARCVIEW. Find other Ogam sites in the area and compare their location to Fogbottom's claims.

4. Turn on the **Roads**. Does this help you locate the Massey Draw site and the area?

5. Turn on the **Digital orthophoto**. Now can you understand the Massey Draw site, and other sites in the area? What is the value of using the imagery as a backdrop to vector data?

Goes w/spatial integration exercise



```
Submitting command to Operating System ...
Arc:

Message from train_4 on sc0918 (UNKNOWN) [Fri Jun 16 09:31:01 MDT 1995] ...
Message from queueing system:
=====> MESSAGE FROM PRINT JOB 57 (STDIN.16686) <=====
0782-089 Output to standard error detected while processing your print job.
         Diagnostic information about the problem has been mailed to you.
         Use local problem reporting procedures.
<EOT>
Message from root on sc0918 (UNKNOWN) [Fri Jun 16 09:31:00 MDT 1995] ...
Message from queueing system:
0781-312 Request STDIN.16686 removed from queue ps300:vpps300.  Could not open o
r stat file(s).<EOT>

Arc: ls
Submitting command to Operating System ...
arch_s1.gen   cave_m3.inf   log           r061420a      tomb4.inf
arch_s1.inf   cave_m3.pa    pictog5.inf   r061420a.inf  tomb4.pa
arch_s1.pa    line_g11.aa   pictog5.pa    r061420b
arch_s2.inf   line_g11.gen  plss_c7.inf   rlefort
arch_s2.pa    line_g11.inf  plss_c7.pa    s600500
Arc: xwd|xpr -device ps|lp -dps300
Submitting command to Operating System ...

_
```

How to identify by file suffix

pa=polygon attribute

polygon area	line	point
.gen	.gen	.pts
.pts	.aa	.pa
.inf	.inf	.inf
.pa		

SCGPS2GIS

SCGPS2GIS <output_cover> <POLYS | LINES | POINTS>

Creates a double precision coverage with data collected by GPS.

Arguments:

<output_cover> - The coverage to be created. The <output_cover> cannot already exist.

<POLYS | LINES | POINTS> - The feature class of the <output_cover>.

POLYS - Will CLEAN the <output_cover> with the POLY option, and a PAT will be created.

LINES - Will BUILD the <output_cover> with the LINE option, and a AAT will be created.

POINTS - Will BUILD the <output_cover> with the POINT option, and a PAT will be created.

Notes:

************************09Jun95*************************

This AML was provided by the BIA's GDSC to NARSC. The routine has been "Alpha" tested for some improvements. Francine B. Patterson, a NARSC intern (Ph.D. candidate, Department of Geography, University of Denver) and Dan Martin, Archeologist GPS/GIS - National Applied Resource Sciences Center (NARSC) continue to work with these routines as of this date. Users should contact NARSC for the most current version and with any problems encountered - 303 236-0105, "internet!ilmscd53.dmartin@sc1429wp.sc.blm.gov" or "dmartin@dsc.blm.gov".

For BLM AIX users:
1) When using AIX DOSREAD routines to upload GPS data, you must convert the loaded ASCII filenames to lowercase.
2) Load the SCGPS2GIS.AML to the same directory as your GPS ASCII files.
3) Inspect data values for blank spaces and if these exist, replace blanks with underscores, i.e., "Massey Draw" to "Massey_Draw". At present, design your GPS data dictionary such that an underscore separates words (no blanks in fields are allowed). This inconvenience is currently being worked.
4) NARSC relate item in the AML is %cover%-id (user-id).

************************09Jun95*************************

SCGPS2GIS is capable of handling only one feature class at a time.

SCGPS2GIS creates a coverage with GPS data from the files generated by PFINDER using the OUTPUT TO GIS command. These PFINDER files can include: area .GEN, .PTS, .INF and .PA files; line .GEN, .INF and .AA files; and, point .PTS, .INF, and .PA files. It is strongly recommended that the file name prefixes (i.e., the portion of the file name preceding the period) for all specified files be exactly the same, character for character; if the specified file name prefixes differ, the resulting coverage may contain inappropriate or incorrect attribute data.

If the POLYS option is specified, SCGPS2GIS first asks the user if the GPS data were collected with the AREA FEATURE. If the response is 'yes,' the

(2)

program then prompts the user to input the area .GEN and the area .PTS file names; the program also prompts the user to input the area .INF and the area .PA file names. The program uses these files to create the <output_cover>. If the the response to the AREA FEATURE prompt is 'no,' the program simply prompts the user to input the name of the line .GEN file and creates the <output_cover> from this; if the AREA FEATURE was not used during data collection with PFINDER, the <output_cover> has a PAT, but the PAT contains no user-defined items or attribute values.

If the LINES option is specified, SCGPS2GIS prompts the user to input the name of a line .GEN file, and uses the Arc/Info GENERATE command to create an <output_cover> containing arcs having vertices with the coordinates from this file. SCGPS2GIS then prompts the user to input the name of the line .INF file related to the specified line .GEN file. If a data dictionary was not used in PFINDER, an .INF file does not exist; if this is the case, pressing <CR> (the default) skips entry of an .INF file name. If a line .INF file was specified, SCGPS2GIS prompts the user to input the name of the line .AA file related to the specified line .GEN and line .INF files.

If the POINTS option is specified, SCGPS2GIS prompts the user to input the name of a point .PTS file, and uses the Arc/Info GENERATE command to create an <output_cover> containing points (i.e., labels) with the coordinates from this file. SCGPS2GIS then prompts the user to input the name of the point .INF file related to the specified point .PTS file. If a data dictionary was not used in PFINDER, an .INF file does not exist; if this is the case, pressing <CR> (the default) skips entry of an .INF file name. If a point .INF file was specified, SCGPS2GIS prompts the user to input the name of the point .PA file related to the specified point .PTS and point .INF files.

```
Example : SCGPS2GIS RDS.GPS LINES

     Enter the line .GEN file name. LINE_D1.GEN

     Enter the line .INF file name. LINE_D1.INF

     Enter the line .AA file name. LINE_D1.AA
```

```
Example : SCGPS2GIS PDT POLYS

     Did you use the AREA FEATURE while collecting data? Y

     Enter the area .GEN file name. PD_ARE1.GEN

     Enter the area label point .PTS file name. PD_ARE1.PTS

     Enter the area .INF file name. PD_ARE1.INF

     Enter the area .PA file name. PD_ARE1.PA
```

③

```
/* Command Name: scgps2gis.aml
/*
/* Execution Mode: Interactive ARC Version 6.0.1
/*
/* Platform : SunOS Version 4.1.1 / Unix
/*
/* Purpose : Takes the files that are generated from the command OUTPUT TO GIS
/*           PFINDER (version 2.31*03) and creates a user specified coverage.
/*
/* Usage : SCGPS2GIS <output_cover> <POLYS | LINES | POINTS>
/*
/* Called By: None
/*
/* Argument Descriptions :
/*    Argument   Type   Req?   Definition
/*-----------------------------------------------------------------------------
/*     cover     char    Y     Name of output coverage that will be created
/*     fat       char    Y     Feature class ie. polys,lines or points
/*
/* Variables  (Global Variables First)
/* Variable   Type  Definition
/*-----------------------------------------------------------------------------
/*   pos      char  Name of the .gen file or the .pts file
/*   pos1     char  Name of the area .pts file if the AREA FEATURE was used
/*   inf      char  Name of the .inf file if a data dictionary was used. The
/*                  default is none.
/*   att      char  Name of the .aa file containing the attributes for lines or
/*                  the .pa file containing the attributes for points or labels
/*   kill     char  Will terminate the AML at the users request
/*   item     char  Item structure read from the .inf file
/* fileunit   num   Current fileunit open for reading
/* openstat   num   Status of file - open function
/* readstat   num   Status of file - read function
/* closestat  num   Status of file - close function
/* delfil     num   Status of file - delete function
/* wspace     char  Current workspace
/* info       char  aat or pat for joining purposes
/* messhold   char  User's &messages setting for later restoring
/*
/* Input Files or Coverages
/* %pos%   File containing the positions of lines or points    *.gen or *.pts
/* %inf%   File containing the .PAT or .AAT structure    *.inf
/* %att%   File containing the attributes for lines or points    *.aa or *.pa
/* No Coverages
/*
/* Output Files or Coverages
/* No Files
/* %cover%  Name of the coverage that will be created
/*
/* Detailed Notes:
/* The AML will ask the user for the appropriate file names from files that
/* were created with the PFINDER command OUTPUT TO GIS. From these files it
/* will create a coverage that was collected with GPS.
/*
/* External Routines Called: None
/*
/* Internal Routines Called: Area feature routine
/*                           Standard Error Routines
/*
/* Operating System Dependencies: Unix / Path Delimiter
/*
/* History:
/*    Author/Site                  Date          Event
/* ----------------------------------------------------------------------------
/*    Craig Marney    BAO-GDSC    01/24/94       Original Coding
/*    Craig Marney    BAO-GDSC    07/14/94       Added the routine area so if
```

(4)

```
/*                                                 data was collected with the
/*                                                 area feature the AML will
/*                                                 ask for the correct files and
/*                                                 run generate correctly.
/*    Lou Henefeld    GDSC         07/21/94        Improved bailout / cleanup.
/* Francine B. Patterson
/*                    NARSC        06/09/95        Improved coverage edit for
/*                                                 "sliver" polygons with
/*                                                 "eliminate" routine.
/* -------------------------------------------------------------------------
/*
&args cover fat
&severity &error &routine bailout
&setvar messhold = [show &messages]
&messages &off
/*
/*
&s att = [unquote ' ']   /* Set the variable here for cleanup purposes only
&s wspace = [show &workspace]
/* -------------------------------------------------------------------------
/* Checks to see if required arguments were supplied
/* -------------------------------------------------------------------------
&if [null %cover%] or [null %fat%] &then
   &call usage
&s cover = [translate %cover%]
&s fat = [translate %fat%]
/* -------------------------------------------------------------------------
/* Check to see if the coverage already exists.
/* -------------------------------------------------------------------------
&if [exists %cover% -cover] &then
   &do
      &type Output coverage cannot already exist ...
      &call bailout
   &end
/* -------------------------------------------------------------------------
/* Check to see if a valid feature class was specified.
/* -------------------------------------------------------------------------
&if %fat% ne POLYS and %fat% ne LINES and %fat% ne POINTS &then
   &do
      &type %fat% is not a valid feature class ...
      &call bailout
   &end
/* -------------------------------------------------------------------------
/* Check to see what feature class was specified so the AML will ask for the
/* correct file.
/* -------------------------------------------------------------------------
&type
&if %fat% = POLYS &then
/* -------------------------------------------------------------------------
/* If this is true the AML will call routine area. The routine generates with
/* poly option and the point option.
/* -------------------------------------------------------------------------
&if [query 'Did you use the AREA FEATURE while collecting data' .true.] &then
   &call area
&if %fat% ne POINTS &then
   &do
      &type
      &s pos = [translate [response 'Enter the line .GEN file name.']]
   &end
&else
   &do
      &type
      &s pos = [translate [response 'Enter the point .PTS file name.']]
   &end
/* -------------------------------------------------------------------------
/* Check to see if the file exists
```

Ⓢ

```
/* ---------------------------------------------------------------------------
&if not [exists %pos% -file] &then
   &do
      &type File %pos% does not exist ...
      &call bailout
   &end
/* ---------------------------------------------------------------------------
/* Checks to see if lines or points were collected with a data dictionary
/* by asking the user for the .inf file. Otherwise the default is none.
/* ---------------------------------------------------------------------------
&type
&if %fat% = LINES &then
   &do
      &type
      &s inf = [translate [response 'Enter the line .INF file name if using a ~
data dictionary. (NONE)' NONE]]
   &end
&else
   &s att = NONE
&if %fat% = POINTS &then
   &do
      &type
      &s inf = [translate [response 'Enter the point .INF file name if using a ~
data dictionary. (NONE)' NONE]]
   &end
&else
   &s att = NONE
&if %fat% = POLYS &then
   &do
      &s inf = NONE
      &s att = NONE
   &end
/* ---------------------------------------------------------------------------
/* Checks to see if the .inf file exists
/* ---------------------------------------------------------------------------
&if %inf% ne NONE &then
   &do
      &if not [exists %inf% -file] &then
         &do
            &type File %inf% does not exist ...
            &call bailout
         &end
      &else
         &type
   &end
/* ---------------------------------------------------------------------------
/* This is where the user may terminate the AML
/* ---------------------------------------------------------------------------
&s kill = .true.
&if %inf% = NONE and %fat% ne POLYS &then
   &do
      &type
      &s kill = [query 'It is assumed no attributes were collected. Do you ~
want to continue.' .true.]
   &end
&if %kill% = .false. &then
   &do
      &type
      &type Run the AML again using the appropriate .inf file ...
      &type
      &call bailout
   &end
/* ---------------------------------------------------------------------------
/* Sets the variable att if attributes were collected. The default is none.
/* ---------------------------------------------------------------------------
&if %fat% = LINES and %inf% ne NONE &then
```

```
   &do
      &type
      &s att = [translate [response 'Enter the line .AA file name’ NONE]]
   &end
&if %fat% = POINTS or %fat% = POLYS and %inf% ne NONE &then
   &do
      &type
      &s att = [translate [response 'Enter the point .PA file name’ NONE]]
   &end
/* --------------------------------------------------------------------------
/* Checks to see if the file exists
/* --------------------------------------------------------------------------
&if %att% ne NONE &then
   &do
      &if not [exists %att% -file] &then
         &do
            &type File %att% does not exist ...
            &call bailout
         &end
      &else
         &do
            &type
            &type Generating the output coverage now ...
         &end
   &end
PRECISION DOUBLE DOUBLE
GENERATE %cover%
INPUT %pos%
%fat%
QUIT
/* --------------------------------------------------------------------------
/* Builds the generated cover according to the feature class
/* --------------------------------------------------------------------------
&if %fat% = POLYS &then
   CLEAN %cover% # # .002 POLY
/* CLEAN %cover% # 1.0 .8 POLY
&if %fat% = LINES &then
   BUILD %cover% LINE
&if %fat% = POINTS &then
   BUILD %cover% POINT
/* --------------------------------------------------------------------------
/* Checks the .pa or .aa file for blank spaces between words that should have
/* been quoted or which should have been connected with an underscore; i.e.
/* massey draw, and replace the blank with an underscore, i.e., massey_draw
/* NEED TO WRITE CORRECT SYNTAX FOR THIS
/* --------------------------------------------------------------------------
/* &sv file %cover%.pa
/* &sv newfile %cover%.pa
/* &sv fileunit [open %file% openstat -read]
/* &if %openstat% ne 0 &then &do
/*  &return &error Error opening input file %file%
/* &end
/* &do &until %readstat%=102
/*  &sv file [read %fileunit% readstat]
/*  &sv new_name [subst %file% ’’_]
/*  &type %new_name%
/* &end
/* &return
/* --------------------------------------------------------------------------
/* If a data dictionary was used the AML will go into INFO and define the
/* datafile and add the attributes to the datafile.
/* --------------------------------------------------------------------------
&if %inf% ne NONE &then
   &do
      &data arc tables
      /* &data arc info
```

⑦

```
      /*  ARC
      /* COMO -NTTY
      /* ----------------------------------------------------------------------
      /* Opens the .inf file for reading and checks the openstat variable
      /* ----------------------------------------------------------------------
      &s fileunit = [open %inf% openstat -r]
      &if %openstat% ne 0 &then
         &do
            &type Unable to open file %inf% ...
            &call bailout
         &end
      /* ----------------------------------------------------------------------
      /* Sets the variable item by reading from the .inf file and checks the
      /* the readstat variable. Also reads from file here for the purpose of
      /* skipping the first record in the file.
      /* ----------------------------------------------------------------------
      &s item = [read %fileunit% readstat]
      &if %readstat% ne 0 &then
         &do
            &type Could not read from file %inf% ...
            &call bailout
         &end
      /* ----------------------------------------------------------------------
      /* Defines the datafile by reading from the .inf file until it finds a
      /* blank line.
      /* ----------------------------------------------------------------------
      &do &until [null %item%]
         &s item = [unquote [read %fileunit% readstat]]
         &if %readstat% ne 0 &then
            &do
               &type Could not read from file %inf% ...
               &call bailout
            &end
         %item%
      &end
      [unquote ' ']
      /* ----------------------------------------------------------------------
      /* Adds the attributes to the datafile
      /* ----------------------------------------------------------------------
      /* ADD FROM ../%ATT%
      ADD FROM %att%
      Q STOP
      &end
      /* ----------------------------------------------------------------------
      /* Sets the variable info by how variable fat is set
      /* ----------------------------------------------------------------------
      &if %fat% = LINES &then
         &s info = AAT
      &else
         &s info = PAT
      /* ----------------------------------------------------------------------
      /* Joins the coverage feature attribute table and the datafile together
      /* ----------------------------------------------------------------------
      JOINITEM %cover%.%info% %att% %cover%.%info% %cover%-id %cover%-id
      &type
      &type Coverage %cover% has been created ...
   &end
&else
   &do
      &type
      &type Coverage %cover% has been created ...
   &end
&call cleanup
&type
&type               ------------------ End of AML ------------------
&return
```

```
/* ----------------------------------------------------------------------------
/*                              ROUTINE AREA
/* This routine will perform a little different from the main AML in that it
/* will generate with the poly option and the point option.
/* ----------------------------------------------------------------------------
&routine area
&severity &error &routine bailout
/* -----------------------------------------------------------------------------
/* Set the variable pos by asking the user for the area .gen file.
/* -----------------------------------------------------------------------------
&type
&s pos = [translate [response 'Enter the area .gen file name.']]
/* -----------------------------------------------------------------------------
/* Check to see if file exits.
/* -----------------------------------------------------------------------------
&if not [exists %pos% -file] &then
   &do
      &type File %pos% does not exist ...
      &call bailout
   &end
/* -----------------------------------------------------------------------------
/* Set the variable pos1 by asking the user for the label point file.
/* -----------------------------------------------------------------------------
&type
&s pos1 = [translate [response 'Enter the area label point .pts file name.']]
/* -----------------------------------------------------------------------------
/* Check to see if the file exists.
/* -----------------------------------------------------------------------------
&if not [exists %pos1% -file] &then
   &do
      &type File %pos1% does not exist ...
      &call bailout
   &end
/* -----------------------------------------------------------------------------
/* Set the variable inf by asking the user for the .inf file.
/* -----------------------------------------------------------------------------
&type
&s inf = [translate [response 'Enter the area .inf file name.']]
&if not [exists %inf% -file] &then
   &do
      &type File %inf% does not exist ...
      &call bailout
   &end
/* -----------------------------------------------------------------------------
/* Set the variable att by asking the user for the .pa file.
/* -----------------------------------------------------------------------------
&type
&s att = [translate [response 'Enter the area .pa file name.']]
/* -----------------------------------------------------------------------------
/* Check to see if the file exists.
/* -----------------------------------------------------------------------------
&if not [exists %att% -file] &then
   &do
      &type File %att% does not exists ...
      &call bailout
   &end
&else
   &do
      &type
      &type Generating the output coverage now ...
   &end
PRECISION DOUBLE DOUBLE
GENERATE %cover%
INPUT %pos%
%fat%
INPUT %pos1%
```

```
POINTS
QUIT
/* ----------------------------------------------------------------------------
/* Clean with the poly option, then eliminate slivers (all polygons except the
/* universe polygon with %cover%-id = 0, then kill original %cover% and rename
/* edited %cover% (%cover%out) %cover%, so joinitem (%cover%) will be correct.
/* ----------------------------------------------------------------------------
CLEAN %cover% # # .002 POLY
/* CLEAN %cover% # 1.0 .8 POLY
ELIMINATE %cover% %cover%out
RESELECT %cover%# = 1
[unquote ' ']
N
Y
NSELECT %cover% POLY
[unquote ' ']
N
Y
RESELECT %cover%-id = 0
[unquote ' ']
N
N
KILL %cover% all
RENAME %cover%out %cover%
/* ----------------------------------------------------------------------------
/* Check for gaps in data values in *.pa data collected with GPS using data
/* dictionary STILL NEED TO WRITE
/* ---------------------------------------------------------------------------
/* ADD THE SET OF COMMANDS TO CHECK FOR GAP AND REPLACE WITH UNDERSCORE
/* ---------------------------------------------------------------------------
/* Go into INFO and define the datafile and add the attributes to the datafile.
/* ----------------------------------------------------------------------------
&do
   &data arc tables
   /* &data arc info
   /* ARC
   /* COMO -NTTY
   /* -----------------------------------------------------------------------
   /* Opens the .inf file for reading and checks the openstat variable.
   /* -----------------------------------------------------------------------
   &s fileunit = [open %inf% openstat -r]
   &if %openstat% ne 0 &then
      &do
         &type Unable to open file %inf% ...
         &call bailout
      &end
   /* -----------------------------------------------------------------------
   /* Sets the variable item by reading from the .inf file and checks the
   /* readstat variable. Also reads from the here for the purpose of
   /* skipping the first record in the file.
   /* -----------------------------------------------------------------------
   &s item = [read %fileunit% readstat]
   &if %readstat% ne 0 &then
      &do
         &type Could not read from file %inf% ...
         &call bailout
      &end
   /* -----------------------------------------------------------------------
   /* Defines the datafile by reading from the .inf file until it finds a
   /* blank line.
   /* -----------------------------------------------------------------------
   &do &until [null %item%]
      &s item = [unquote [read %fileunit% readstat]]
      &if %readstat% ne 0 &then
         &do
            &type Could not read from file %inf% ...
```

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BLM - NATIONAL TRAINING CENTER

Course Title:	GEODATA COLLECTION & USE (for Ecosystem Mgmt.)	*Course Number:*	1730-11C
Scheduled For:	June 12-16, 1995	*Duration of Course:*	40 Hours
Coordinator:	Diane C. Nelson	*Location of Course:*	BLM Service Center, Denver
Instructors:	Pam Clemmer, Melinda Walker, Dan Martin (Service Center, Applied Sciences), Gretchen Meyer (Wyoming S.O.), Ken Bays (Oregon S.O.), Phil Wilkins (Arizona S.O.), Adrian Caufield (Colorado S.O.), Stan French (U.S.F.S., R-9)		

Monday: June 12	**Tuesday:** June 13	**Wednesday:** June 14	**Thursday:** June 15	**Friday:** June 16
convene 8:00 am **Introduction:** - welcome / housekeeping - course objectives * *skill check scenarios* 8:00 - 9:00 (Diane) **Coord. Systems & Datums:** - NAD 27, NAD 83, WGS 84 - geodetic, plane coordinates - units of measurement 9:15 - 11:30 (Ken, Pam)	convene 8:00 am **Data Sources:** * *assessment by group* **Records Administration:** - requirements (OARD) - data stewardship - electronic exchange/share 8:45 - 10:00 (Adrian) **RDBMS:** "Relational Data Base Mgmt.Syst." - tables, entities, queries, etc. 10:15 - 11:30 (Melinda)	convene 8:00 am **Global Positioning System:** - basic geodesy - satellite positioning 8:00 - 10:00 (Ken) **Geographic Info Systems:** - data dictionary 10:15 -11:30 (Dan) ** Depart for Field Trip ** Lunch with Group	convene 8:00 am **GIS Logic:** - point, polygon, lines, matrix - data types, vector & rastor - themes, layers * *analog assessment* 8:00 - 10:00 (Gretchen) **GPS:** (computer) - download data, P-Finder * *collection assessment* 10:15 - 11:30 (Ken)	convene 8:00 am **Spatial Analysis Integration:** - ARC/INFO software - pre-planning - layer analysis - coincidence (data hiatus) - data modeling * *integration use assessment* 8:00 - 11:30 (Dan)
LUNCH BREAK 11:30 - 12:30				
Cadastral Survey: - Public Land Survey System - plat & field notes - control networks - legal interpretation 12:30 - 2:45 (Stan) **GCBD:** "Geodetic Coordinate Data Base" - using PLSS coordinates in data base files 3:00 - 4:30 (Phil)	**RDBMS continue:** **Data Standards:** - metadata, FDGC/NSDI 12:30 - 1:45 (Melinda) **Remote Sensing:** - procedures for selecting the most appropriate tool - multi-stage analysis - spectral or spatial - ecosystem perspective 2:00 - 4:30 (Pam)	**GPS @ Ken Caryl Ranch:** - data collection techniques - differential techniques - properly attribute - data conversion - demonstrate use with resourse project 12:30 - 4:30 (All)	**Spatial Analysis:** - existing data - digitizing - scanning - standards 12:30 -3:15 (Dan, Pam, Melinda) **Jeopardy (Geo-pardy):** * *GeoData Assessment* 3:30 - 4:30 (All)	**Spatial Analysis Integration continue:** - data partnerships - Internet, FTP access 12:30 - 3:00 (Dan, Melinda)

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Course Title:	GEODATA COLLECTION & USE (for Ecosystem Mgmt.)	*Course Number:*	1730-11C
Scheduled For:	June 12-16, 1995	*Duration of Course:*	40 Hours
Coordinator:	Diane C. Nelson	*Location of Course:*	BLM Service Center, Denver
Instructors:	Pam Clemmer, Melinda Walker, Dan Martin (Service Center, Applied Sciences), Gretchen Meyer (Wyoming S.O.), Ken Bays (Oregon S.O.), Phil Wilkins (Arizona S.O.), Adrian Caufield (Colorado S.O.), Stan French (U.S.F.S., R-9)		

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